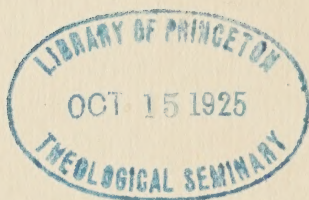


GOD IS WRITING A BOOK

HOWARD L. WALDO, M.D.

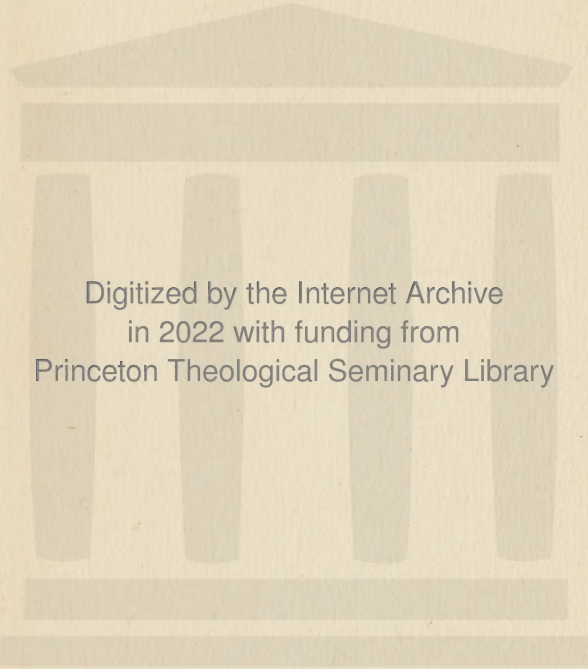




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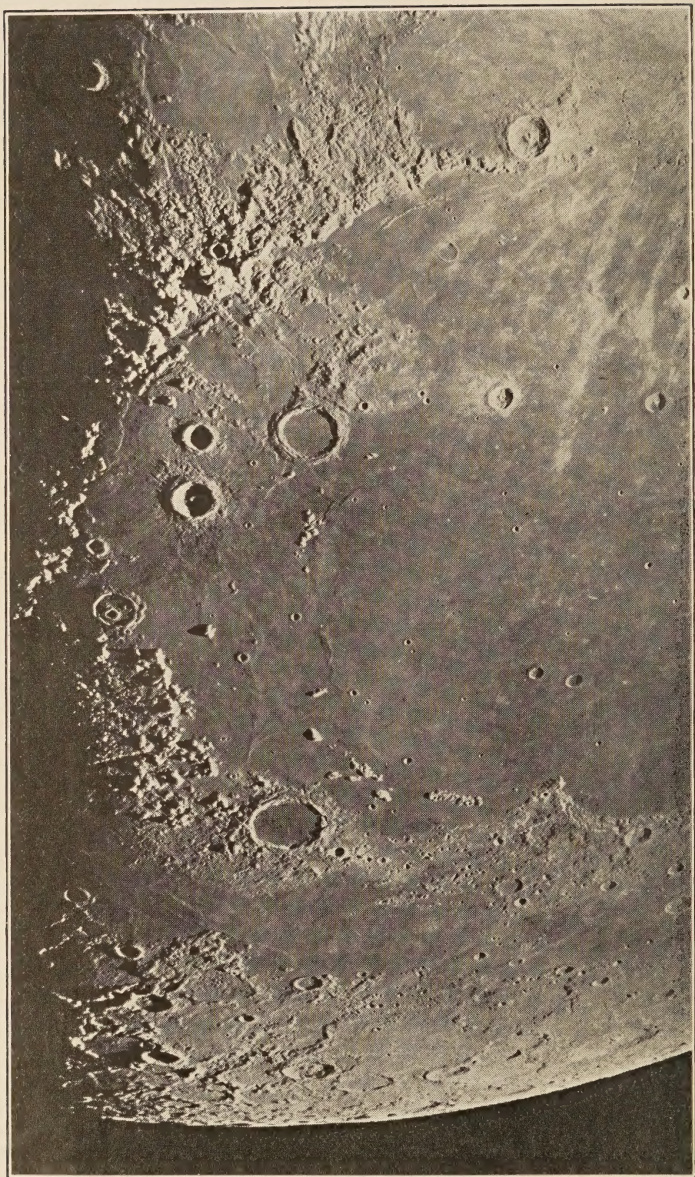
God is writing a book



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GOD IS WRITING A BOOK

HOWARD L. WALDO



Craters and evidences of volcanic action on the surface of the moon. The surface of the earth resembled this in pre-geologic ages. *Photograph by courtesy of Mount Wilson Solar Observatory, Carnegie Institute, Washington.*

God Is Writing a Book

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HOWARD L. WALDO, M.D.



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To the Memory of My Daughter
BERTHA WALDO VAN BLARCOM
Who is "Among the Seraphs, Round About
God's Throne"

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PREFACE

The author of the following pages does not claim that they contain any original ideas. Whatever ideas they may contain have been gleaned from many sources, the result of a course of reading which covers a period of many years; and the writer is unable, after such a lapse of time, to tell, in many instances, the source from which a particular thought has been derived.

By reading and re-reading the inspirations of a favorite author and pondering upon his philosophy, his ideas eventually become your own, a part of your mental and spiritual life. A man who for years has made a practice of marking all the striking passages in all the books he reads, and frequently recording in his notes the ideas which these passages suggest, though not always exactly copying what he reads, may transcribe his notes and fail to recognize or remember the source from which they came. So, if anyone detects plagiarism in these pages, the author will plead guilty in advance.

The author is deeply indebted to the writings of Darwin, Tyndal, Huxley, LeConte, Arrhenius, Breasted, Professor Charles A. Young, Simon Newcomb, H. G. Wells, Sir Robert S. Ball, Henry Drummond, O. M. Mitchell, Sir Oliver Lodge, Henry F. Osborne, J. H. Fabre, G. Frederick Wright, John Fiske, Chalmers Mitchell, Emerson, Croll, Roosevelt, Sir John Lubbock, Carlyle, Lecky, Biblical writers and others, for the ideas which he has tried to absorb and make his own, and which he has here endeavored to express. He has not been a reader of infidel or atheistic literature, and is not familiar with the mental attitude of those who scoff at religion and the teachings of the Bible. He has felt for many years that religion, which is simply love and veneration for the

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Creator and love of mankind, must be stripped of the confusions of theology, which have been taught and subscribed to for many centuries, before it can accomplish its great work, the comfort and elevation of man and his release from the superstitions which he has inherited from his remotest ancestry.

Few people *think* on religious matters; they take their religion, with its theological encumbrances, as it is given to them by the clergy, with the assurance that hell and damnation will be the everlasting portion of those who disbelieve or reject. Religion and theology have thus become one and inseparable, and must be accepted or rejected as such, the individual assuming the consequences of his choice.

It is a quite recent notion, and one not generally held, that a man may see God in the stars and clouds and storms, in the ocean and forests and extended landscapes, in the mountains and in the flocks and herds, and in the faces of men and women and innocent children. That man may adore the God who made all these things, love Him and his fellow man, and devote a life of strenuous service to those who are weak and sick, vicious and ignorant, unfortunate and filthy, and still not be a depraved sinner, although he feels no need of a Savior and is not conscious of guilt. If his life conforms to the highest standard of his generation he is not worried about his future state. When his pastor or his bishop or the pope announces "*Thus saith the Lord*," he is likely to remark, "Is that so? How did you hear of it? 'Lord, who shall abide in Thy tabernacle? Who shall dwell in Thy holy hill? He that walketh uprightly, and worketh righteousness, and speaketh the truth in his heart; he that backbiteth not with his tongue, nor doeth evil to his neighbor, nor taketh up a reproach against his neighbor; in whose eyes a vile person is contemned, but he honoreth them that fear the Lord. He that sweareth to his own hurt and

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changeth not. He that putteth not out his money to usury, nor taketh reward against the innocent. He that doeth these things shall never be moved. He that hath clean hands and a pure heart' shall see God."

A man may be guilty of stinginess, intemperance, anger, cruelty, laziness, be both a physical and moral coward with affection for still other vices, and still not hate God. He may even yet strive by all means in his power to escape from these vices, and attain unto the clean hands and pure heart which will enable him to see God.

What is said about the church in these pages must not be construed as an attack, for it is not; simply a few facts have been stated—a very few; many more of the same sort might have been mentioned.

There is no reason why the truth should not be stated. History should neither be suppressed nor falsified. It is no disgrace to an individual that improprieties and brutalities were practiced or even tolerated by his forbears, so long as he does not practice or tolerate them. It is no disgrace to an organization that its founders and early adherents were guilty of practices which we, in these enlightened days, condemn.

Man is a religious animal; he cannot live without religion, but that religion must be adapted to his growing intelligence, and must conform to the scientific knowledge of the age, or it will not be acceptable. Religions die hard, and advancing civilizations have ever been hampered with theologies that had outlived their usefulness and are out of harmony with the culture and intelligence of the times. Our own age is no exception. There are more educated people now than ever before; more who are able and inclined to judge of the reasonableness of a dogma, and who will not accept a faith which does not appeal to their common sense, or which is antagonistic to the demonstrated facts of science.

It is desirable above all things that men should have

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a religion by which they may live and die, which may guide them to the truth, and which may be readjusted from time to time to conform to the new truths which science may reveal to men. There is no impiety in this revision of creeds, and it should be done without conflict or bitterness. Where is there a better place to learn the truth than in the book which God is writing? and is it not high time that men should read and believe that book?

Science and religion should be one; there can be no conflict between them if both are true, and, if there is not complete agreement, both should be carefully examined for errors, which should be as promptly and honestly eliminated from the one as from the other.

It is pitiful to see men bound by ancient creeds, afraid to enjoy the overflowing bounty which God has given them for fear they may offend Him, afraid to question the authority or sanctity of their creeds for fear of drawing down upon themselves the wrath of an offended God. When we criticise the church we do not mean its humble and devout members; they are the victims of ignorance, superstition and fear, and, in general, are doing the best they know. It is the organization which holds them in bondage that is to be held to account before the intelligence of coming centuries.

We know so little of the political and social evolution of the Far East that no account has been taken of it in these pages. It would seem that Europe and America furnish all the material for lessons along these lines that is needed.

We have good reason to believe that China, up to the fourteenth century or later, was possessed of a culture far in advance of any that existed elsewhere, after the decay of Greek and Roman culture in the fifth century A.D. The Chinese early developed a code of manners which indicated a refinement of sentiment and an appre-

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ciation of the rights of and respect due to others which we of the twentieth century might copy with advantage. They were centuries in advance of Europe in their development of the arts of agriculture, pottery making and painting, and probably had developed, in a crude way, the art of printing and the manufacture of gunpowder.

Why did not China continue to lead the world in the arts, sciences and refinements of civilization? Perhaps the answer is not hard to find. Her religion has been a veneration and worship of her ancestors; what was good enough for her grandfather was good enough for her. There was little in the teachings of Confucius to encourage a desire for change, and for centuries a liberal education in China has consisted almost solely of an ability to read, and the memorizing of innumerable pages of Chinese classics. The written language of the Chinese is so complicated that it is the labor of a lifetime to learn to read, write and memorize the classics, leaving no time for original thought and philosophizing.

Troy, N. Y.

HOWARD L. WALDO.

GOD IS WRITING A BOOK

CHAPTER I

God is writing a book. He has been writing it for countless millenniums, and will continue to write for countless millenniums. The book will never be completed, for, as God had no beginning, so He will have no ending; and He will continue to record His wonderful works in His book throughout eternity. God is in no hurry to complete His records and does not desire that men shall read them until the fulness of time. Thousands of pages in this book were written before men appeared on this planet, and only a few of them has man so far attempted to read. The very existence of these pages is one of man's quite recent discoveries.

A peculiarity of this book, in which it differs from all others, is that it is entirely true. It contains no errors. The best and wisest men have frequently fallen into error in the books which they have written. They have unintentionally distorted facts and drawn erroneous conclusions, but God never mis-states a fact or makes an error in recording the progress of His work, and unlike man, He never speculates or draws conclusions.

His book will never be revised. It will stand forever as it is written.

Few men know of its existence and fewer care to read it. Some of its pages lie open for whosoever has eyes and a heart to learn; but some of its pages are covered deep under the mountains and the oceans, and some are

hidden among the stars, to be read only by those who are hungering and thirsting for knowledge, willing to devote their lives to the search for truth as written by God.

Many of its pages are bound up with the history and literature of the human race, and can only be identified and separated from the pages written by man by those who have spiritual discernment and are willing and able to read and believe God's book rather than the writings of fellow mortals.

Some of its pages are written on the minds and hearts of men and women and children, and may be discerned in the great social, political and religious movements of human history.

It may thus be seen that God uses all sorts of material on which to write, and the implement with which He writes is ever varying. He is writing all around us every day, but we do not often see His message, and when we see it we frequently refuse to read.

Poor, ignorant, stupid man must learn to read, for only by so doing can he become wise. And as he reads, those truths which were once obscure will become clear.

When the little child learns first to read, he cannot understand all that wise men write; but as the years go by and he perseveres, these obscure passages become clear to his growing mind. So he who is learning to read God's book must at first laboriously spell it out, often without understanding; but if he will patiently strive to learn and comprehend, he will more and more appreciate the great book which God is writing. He can never, in this world, comprehend it all. God is infinite and His book is infinite, and it will require eternity and an infinite mind to understand Him and His book.

Let us learn to read this book as best we may, and accept its teachings though they may not always confirm the teachings of men and though they may destroy venerable superstitions which have been dear to us and to our ancestors.

Let us never forget that what is written in this book is true, and that all truth is divine; there is no such distinction as secular truth and divine truth.

God's book records the things which He has been doing for ages past, although perhaps not all that He has done. Some of its pages, probably many of them, are so far beyond our comprehension that we can never know of their existence while we remain in this tabernacle, and it may be one of the occupations of eternity to find them out and read them.

Besides being a record of God's activities, this book tells us of His laws, which do not change. They not only govern this earth in the minutest detail, but the universe of which this planet is an infinitesimal part.

When created beings break God's laws the penalty is sure. The fact that the disobedience was due entirely to ignorance does not affect the punishment in any particular; therefore a knowledge of God's laws is of more importance than any other knowledge, and can be obtained only by reading God's book. While sages and holy men of ages past have been able to read occasional pages of this book, and have had faint conceptions of the magnitude and importance of the volume from which these pages were taken, mankind as yet is only commencing its study and has not even learned its entire alphabet.

Science, which, if genuine, is a search for truth, is slowly picking out the words and arranging the pages, so that future generations may read more easily and more correctly.

"Science consists of the body of well ascertained and verified facts and laws of Nature. It is clearly to be distinguished from the mass of theories, hypotheses and opinions which are of value in the progress of science."¹

In reading this book whose author is God, the wisest men are often unable to translate it or comprehend its meaning, and some are unwilling to admit that there is

¹ *The Origin and Evolution of Life*, H. G. Osborne, p. 1.

anything written at all, or that God delivers any message except by direct communication through the minds and writings of men.

His book is a revelation of God written by Himself, and, as studied and translated in recent centuries, enables us to know some things of His majesty and greatness and power which were not revealed to the men of former days.

Zophar the Naamathite voiced the conviction of his age when he said: "Canst thou by searching find out God? Canst thou find out the Almighty unto perfection? It is as high as Heaven, what canst thou do? Deeper than Hell, what canst thou know? The measure thereof is longer than the earth, and broader than the sea."

Truly, many of the ways of God are past finding out. His ways are not as our ways nor His thoughts as our thoughts, but we should strive to learn to read His book, for therein we find many things written about His ways and thoughts and laws which were past finding out in the days of Zophar, but which now are so plainly written that he who runs may read them if he will.

While mortal man, immortal if you please, will never know the "Almighty to *perfection*," he may find out so much of Him as to be able to worship Him in spirit and in truth, if not indeed the whole truth.

The heights of heaven were inaccessible to Zophar the Naamathite, and he supposed they would always remain beyond the ken of man, but modern science has scaled heights and penetrated depths to immeasurable distances; has determined the motions and sizes and weights and chemical compositions of many stars in the firmament, and is continually adding to our knowledge.

Edward Everett, in an oration at the dedication of Dudley Observatory, Albany, said, "From more than two hundred observatories in Europe and America the glorious artillery of science is nightly assaulting the skies"

and is gaining wonderful triumphs in those glittering fields.

Science has penetrated deeply into the structure of our globe, and has learned many things about its history which take us back millions of years before the days of Zophar,—things which are so plainly written in this book of God's that no one can misunderstand.

When Zophar told Job that the measure of God was longer than the earth and broader than the sea, he had no conception of the greatness of the truth which he was stating. He supposed that this infinitesimal earth of ours was the centre of God's universe, the special and only great object of His care: that the sun and moon and stars revolved about it to give it light and heat, created solely for its benefit.

When he stated that God was bigger than the earth and sea, he had stretched his imagination to its utmost limit and he supposed that man could go no farther. But by searching, man has gone infinitely farther, and will continue to advance and learn of God as long as it shall please God to leave him upon His footstool.

The Hebrew poets and seers had a poetical conception of the wisdom and majesty and power of God, but they knew so little, in detail, of His works and laws that their writings must today be classed as poetical fictions, though poetry and fiction of the sublimest order.

Dogmatists have ever discouraged and often forbidden the reading of God's book, as they have forbidden the reading of many good books written by men, for fear that God's truth might expose the superstitions of ages and contradict the dogmas of men. Even the wise and good Prophet Isaiah says, "There is no searching of His understanding."—*Isaiah* XL : 25. This was a poetical truth when it was written, but it is not a scientific truth today.

Man should read God's book in a devout and humble spirit, never for a moment forgetting who its author is,

and he should announce his interpretations with all modesty and reverence, for God's truth must not be twisted to a lie.

Countless books have been written by men telling us all about God: what He thinks, how He feels, what He will do, what He regards as sin and what His attitude is toward the sinner. They tell us how to determine who will be forever blest in the enjoyments of Paradise, and who will be forever tormented in the fires of Hell. Various methods have been invented by which the guilty one may escape the damnation he so richly deserves, and reap the rewards of the righteous after having enjoyed all the pleasures of sin.

The men who have written these books and devised these schemes of redemption have often been good men who verily believed that the truth was in them and that they were called of God to "save" the world. Often their standards of morality have been high, and the world has been immensely benefited by their saintly lives and teachings, though a major portion of their teachings was manifestly error, the wisdom of man, which is foolishness, and not the wisdom of God.

So far as we can learn, all the civilizations of ancient and modern times were largely influenced by the popular or current conceptions of the deities. In Greece and Rome there were many gods, most of whom were not possessed of or influenced by high standards of morality: as a consequence, their worshipers were no better than the gods of their own making. These gods were simply men and women of a larger growth, in whom were found all the passions and lusts of mortals.

It was left to the Hebrews to develop a god of righteousness. The process of his evolution was a slow one. Most of their liturgy and ceremonial worship was copied from the barbarous tribes about them, and their god in early times was a fierce and terrible deity to be feared,

and only propitiated by the endless taking of life and the shedding of rivers of blood.

This horrible god, who ordered the extermination of whole races of people who were no worse than their neighbors and the people who were commanded to exterminate them, was slowly supplanted in the Hebrew mind by a god of mercy and justice who would not tolerate iniquity.

Human sacrifices were common among the tribes in Canaan and surrounding countries, and would seem to have been almost universal among almost all primitive peoples. These human sacrifices were supposed to bring general prosperity and cause an abundant harvest. Influenced by example, Abraham concluded that an angered god could be best appeased by the sacrifice of his son Isaac. It was perfectly natural that he should relieve himself of all responsibility in the matter by asserting that he was obeying the command of God, and to this day there are good people who try to excuse Abraham for a crime which he eventually had not the courage to perpetrate, by exonerating him on the grounds he himself offers.

We should not worry about this horrible god of the early Hebrews; he was man-made, and not the One whom we adore and Whose book we shall try to study.

When the Hebrews first grasped the idea of monotheism they clothed God with many, perhaps most, of the gross qualities of the heathen gods about them, and eased their consciences, after committing the most awful crimes, by asserting that they were obeying the God of the Jews.

The ancient Hebrew literature is rich, exceedingly rich, in history and myth, legend and poetry and fiction. When the author of the *Book of Job* had completed his wonderful poem he had no idea that any future generations would consider it an historical document, any more than Shakespeare presumed he was writing history when he wrote *Hamlet*, *Prince of Denmark*, or Tennyson when he

wrote *The Idylls of the King*, or Homer when he penned his immortal verse.

It is not to be supposed that whoever wrote the history of the creation as contained in the *Book of Genesis*, had any idea that the literary critics of succeeding ages would accept it as authentic history, much less as the word of God. Until the time of Abraham this book is legend and myth, not history. The *Book of Jonah* is a fine example of the short story, but not of an historical document.

The Hebrew poets and prophets were men of the highest ideals and great literary gifts, and they often rose to the sublimest heights of eloquence. They were men of the deepest religious convictions, philosophers and seers who were able to penetrate the future because they had studied the past and had a correct appreciation of moral values. They apprehended the moral laws of the universe, and were thus able to predict accurately the results of human conduct. But modern theologians have attributed to their writings a significance which they themselves would never have acknowledged, and claim for them an authority which they would have repudiated. In so far as they spoke God's truth and raised the souls of men from the contemplation of that which was false and earthly and carnal to truth and justice, holiness and godliness, they were writing a page in God's Book.

What shall we say of Saint Paul? How can we express our admiration for his saintly life, his zeal, his enthusiasm and his amazing labors in elevating the standards of morality and promoting true religion in the hearts of men? When he reasoned of righteousness and temperance and justice it is no wonder that Felix trembled and that Festus called him crazy. It seemed to these judges, as to some more modern judges, that any man who would devote his life to the practice of temperance and justice and righteousness must be demented. It was very well to extol these virtues in the abstract, but to practice them

in the concrete was to them evidence of a diseased mind.

Paul's undoubted sincerity, his sure grasp of the highest principles of morality, and the living church, of which he was the founder, have placed him beyond the range of criticism for nearly nineteen hundred years. If it had not been for his labors what would have become of the early church? What other apostle had the physical courage or the mental equipment to face and conquer a hostile world? And what would future ages have known of Christianity if it had not been for the labors and writings and personal zeal of Paul? As the centuries go by, his influence is more and more potent for good: as men grow wiser and better they more perfectly appreciate the perfection of his moral precepts and his interpretation of the wonderful teachings and life of Christ, his Master.

If subsequent history has shown that he was in error as to the time and manner of the triumph of righteousness and its reign upon earth, that in no way reflects upon the soundness of his intuition that the time would come when righteousness would fill the whole earth, and the King of Righteousness should be its ruler. Paul apparently thought he knew who that King would be. Perhaps he did (?).

Paul was a man, and like other men was not always able to escape or rise above the customs and superstitions of his age and the traditions of his elders and associates; but this does not affect the moral character of his work. At our distance, and with our opportunities, we can see clearly some things that were beyond his vision. Paul was a man and wrote and lived as a man, but in his life and writings we may clearly discern one of the pages of God's book; such a page as perhaps it has been given to no other man to write.

Theologians and dogmatists have, for these many centuries, been teaching men that the ancient Hebrew literature, the writings of the early Christian church, the writ-

ings and traditions of the fathers are the word of God. Further than this, these same theologians and dogmatists insist that we must accept as the word of God the interpretations which they have seen fit to make of these writings of men. Hell and purgatory are the reward of those who refuse to accept the teachings of the church in these matters.

Repudiating its authority and denying the truth of its theology we must not forget the wonderful influence for good which the church has exercised in the past and is exercising today. What could most men and women do without their church and their faith? How could they endure existence longer if it were destroyed?

"Strong was he that had a church, what we can call a church; he stood thereby, though in the centre of immensities, in the conflux of eternities, yet manlike towards God and man; the vague, shoreless Universe had become for him a firm city and dwelling which he knew. Such virtue was in belief. Well might men prize their *Credo*, and raise stateliest temples for it and reverend Hierarchies, and give it the tithe of their substance; it was worth living for and dying for."²

Other churches than the Christian church and other religions than that championed by Paul have met the needs of millions of peoples.

The pagan Greeks and Romans, while they had countless gods, did not have much religion, and, aside from the comforts of philosophy, had not much to live or die by.

Prince Gautama, the founder of Buddhism, so accurately divined the needs of the oriental mind and soul that to this day about one-third of the human race are content to live and die in the Buddhist faith.

To the practical modern mind the conduct of Gautama in forsaking his wife and newborn son to lead the lazy life of a ragged tramp, searching for wisdom and light by sitting alone in the forests and later engaging in end-

² *French Revolution*, Carlyle. Vol. I, Chap. 11, p. 7.

less talk with men as lazy and ignorant as himself, seems the acme of absurdity, cruelty and heartlessness. He forgot his great first duty to his wife and child and left them to their fate, that he might lead the life of a mendicant, eating the food which had been prepared by the labor of others, and devoting himself to meditation that he might find peace and repose for his own selfish soul.

Gautama was hailed as the Buddha by his disciples; his paternity was not of man, his mother was a virgin at the time of his birth, having become pregnant as the result of a dream. These virgin births are not uncommon, even at the present time, as any physician having a large general practice can testify. Perhaps Gautama wrote a page in God's book.

The absolute self-abnegation and limitless love taught by Gautama is well illustrated by the following fable: "Buddha, incarnated as a hare, jumped into the fire to cook himself for a meal for a beggar, having previously shaken himself three times, so that none of the insects in his fur should perish with him."³

The moral precepts of the wise man Confucius have served, to some extent, to keep from putrefaction the minds and souls of other millions. It can hardly be said that he wrote a page in God's book—perhaps a line.

Mahomet, though not a great prophet, did a great work. He rescued millions of people from idolatry and nature worship, and taught them that there was but one God. His teaching was crude, his morality sensual and his ideals low, but his religion was better than that which it supplanted, for it was monotheistic. Mahomet was the author of a book, but we can concede to it only a small place in God's great book.

Many other faiths and crude superstitions have held in bondage the minds and souls of men. They have been largely religions of fear; the earth and the sea, the air and the forests have been peopled with demons, to propitiate

³ *Varieties of Religious Experience*, William James, p. 283.

whom incantations and sacrifices and painful penances and often human sacrifices have been thought necessary. Mankind has lived in terror of these false gods, the creation of his own benighted imagination, "till all the joy of living has been quenched by fear." All the spectacular manifestations of Nature—earthquakes, volcanoes, cyclones, lightning and thunder, eclipses, and epidemics of fatal diseases, have been looked upon as evidences of the wrath of the gods.

God has always been a mystery and always will be, and primitive man has always needed a symbol, a temple, or a priest, before which and through whom he could approach the deity and receive some assurance of acceptance and pardon. The utterances of these priests or oracles, like the words of wisdom from the oracle at Delphi, have always been received with awe and reverence. The temples have often been places of asylum to which the criminal and the persecuted could flee for safety, and within which no physical violence need be feared. The offices of priest, medicine man, and physician, were often combined in the same individual, who, within the precincts of the temple, and before the visible symbols of the deity, could drive out the evil spirits which were causing disease, and at the same time secure the favor of the god by making a suitable offering. In this manner temples often became hospitals, and pools of Bethesda held out hope to the souls and bodies and minds of suffering sinners.

False prophets have arisen in every age, who, inspired by the lust for power, notoriety or lucre, have not feared to speak "in the name of the Lord" for their own personal profit. It has been a favorite scheme of these deceivers to require of their followers a fairly high standard of morals, and to preach a religion more or less spiritual. These things serve to blind the eyes of the simple and to unloose their purse strings.

Joseph Smith, the founder of Mormonism, pretended to have discovered, by the spirit of God, the *Book of*

Mormon, in a mound in Wayne or Ontario County, in the State of New York; it was written on metallic plates in an unknown, lost language. This language he was able to read by using a pair of spectacles called urim and thummim, found in the mound with the plates. Smith was manifestly an imposter, though we should not accuse all his followers of insincerity, for many of them have proven by their lives and their devotion to duty that they were above reproach. Their founder inculcated the practice of all the virtues and did not tolerate polygamy; the latter was the result of a subsequent "revelation" to his successor, Brigham Young.

Mrs. Eddy was, perhaps, the shrewdest of the modern false prophets. Under the guise of an unctious sanctimoniousness she succeeded in drawing untold wealth from the pockets of the simple, and succeeded in convincing many people that the testimony of the senses was not to be accepted. Like hosts of other freak religions, her doctrines are having their day, and soon will be heard of no more.

CHAPTER II

“When I consider Thy heavens, the work of Thy fingers, the moon and the stars which Thou hast ordained, what is man that Thou art mindful of him?”

“Thy throne eternal ages stood
Ere seas or stars were made;
Before the hills in order stood
Or earth received her frame.”¹

A consideration of the heavens has always been a source of inspiration to the devout soul, and the more accurate and complete the knowledge of the observer the more is he filled with awe and reverence. The Hebrew poet knew almost nothing of the bright objects which attracted his attention: their distance, size, motions, and composition were matters about which he could not possibly have any accurate information. Had he known what we do about these matters he would certainly have been filled with astonishment when told that there are, in these days, men who can behold this daily manifestation of the power and wisdom and greatness of the Almighty and still not bow in reverence, or who can even deny that there is a God.

Most people who believe in God, who admit that He is a great God, who will agree that He is all-powerful, still have no conception of the greatness of His universe, or the vast extent of His power and the splendor of His creation. When they admit that He is the God of the whole earth and has controlled and will control all its destinies through all time, they have about reached the limit of their appreciation. The world is slow to realize

¹ Isaac Watts.

that God is writing every day in this great book of His, and that man, insignificant and ignorant as he is, may read some portions of this book, and, by study, may progressively read more and more and understand it better and better.

The idea that our solar system—which includes the Sun, Mercury, Venus, the Earth, Mars, about seven hundred asteroids, Jupiter, Saturn, Uranus and Neptune, with numerous satellites or moons, and at least some of the comets—were all formed by the condensation, contraction, and eventual cooling of an immense nebula, was original with the great philosopher Immanuel Kant, who died in 1804. The French mathematician Laplace developed this theory still further, which is now generally known by his name, *Laplace's Nebular Hypothesis*. This hypothesis, which is simply the preface to the doctrine of evolution as further developed by the immortal Darwin, has been the ground for many a fierce conflict between the scientists on one hand and the theologians and dogmatists on the other. The latter controversialists have not seemed to be able to understand that all truth is God's truth, and that when God writes a chapter in His book He is simply recording what He has done and the laws by which He operates, making no effort to conform to the opinions or dogmas of men.

“Deep in unfathomable mines
Of never-failing skill,
He treasures up His vast designs
And works His sov'reign will.” ²

The scientist has been asked many times: “How do you know that our solar system developed from a nebula, and that suns and planets are now being formed by the rotation, condensation and cooling of nebulae?” The answer has been: “I know it by observation and reflection, and I am unable to arrive at any other conclusion.”

² Cowper.

The familiar illustration of the apple seed and the apple tree is perhaps known to all: the apple seed does not look very much like the apple tree. If we had had no opportunity for observation we should say that they were in no way related, and that those "self-styled scientists," who "assumed" that the little apple seed had in it the potentiality of the matured apple tree with its blossoms and fruit, were not entitled to serious consideration. But if we will observe and reflect for a few years, we may change our minds. If we plant the seed in favorable soil and give it light and water, we may soon find the little twig sprouting out of the ground, and in a few years we are convinced that the growth is an apple tree. If we will observe its surroundings carefully we will notice that there are other similar twigs and trees in all stages of development, from the smallest sprout to the mature growth, to the tree that is dying and that is dead.

This is exactly what astronomers and other scientists have done: they have observed thousands of nebulae, at least 120,000, and have found them in various stages of development from the thinnest gas to an astitial body. There is no reason to suppose that these represent all the nebulae in the heavens—there is good reason to believe that their number is past finding out.³ Professor Keeler found many nebulae revealed on his photographic plates that could not be seen through any telescope, their faintness being due to their great distance and not to their small size or lack of luminosity. Sir William Herschel was the first astronomer to note carefully the number, size and differences in the various nebulae, and to him and to his sister science is indebted for much that is now known about these wonderful bodies.

The diameter of the great nebula in Orion is estimated at 5,700,000,000,000,000 miles. This figure can mean nothing to us, for it is beyond the capacity of the human

³ *The Earth's Beginning*, Sir Robert Ball. Photographs on pp. 41, 45 and 71.

mind to grasp; we can only realize that this nebula is of vast extent, and that there are others perhaps equally vast.

⁴ The great nebula in the constellation Andromeda is one of the most interesting and awe-inspiring objects in the heavens.

It is often impossible to distinguish, by the telescope, a nebula from a cluster of stars, but this differentiation can be made by the spectroscope, and by this means it has been found that many nebulae are immense bodies of incandescent gas. The spectroscope has also shown that many, perhaps most, of the chemicals with which we are familiar, are to be found in the nebulae and in the stars, very prominent among which is calcium. So far as scientists can discover, we are justified in saying that in God's universe nothing is lost; matter changes its form, but never is diminished or lost. If a body is set in motion, it will move on forever in a straight line and with its original velocity unchanged if it is not influenced by the proximity of other bodies. We know that the heavens are filled with bodies, great and small, luminous and dark, moving in all directions with tremendous velocities, and we have reason to believe that collisions occur between these great bodies. Such collisions must result in the development of heat sufficient to convert all known substances into a vapour: nothing is lost of the substance of either of the colliding bodies, but their physical condition is altered from a solid to a vapour.

It has been estimated,⁵ that the nebula from which our solar system has been evolved, originally contained energy equal to that which would be produced by the combustion of 8300 globes of solid coal each equal in weight to our sun. Not quite half of this energy has been expended, but it is being rapidly consumed.

The sun is contracting at the rate of approximately 200 feet a year or about 4 miles in a century,⁶ and this

⁴ and ⁵ *The Earth's Beginning*, Sir Robert Ball, pp. 41, 45, 71 and 350.

⁶ *Astronomy for Everybody*, Simon Newcomb, p. 104.

contraction is what enables it to maintain its heat supply.⁷ The consequent development of heat will continue until all the energy developed in the sun by the cataclysm which produced the primeval nebula has been expended, and the orb of day has become a solid frozen mass. This will not happen in millions of years; the plans of God are worked out very slowly, and many things may happen before the sun becomes a frozen globe.

The origin of our solar system may be assumed to have been somewhat as follows: ⁸ Two bodies of approximately equal size, whose combined weight equalled that of our entire solar system, and each moving at the rate of 460 miles per second, came into collision. The result was the generation of heat sufficient to convert both bodies into a mass of incandescent vapour, the mass, at the same time, retaining the combined momentum of both bodies. As a further result of this collision, the particles of consequent nebulous vapour received a tremendous impetus to violent motion in every direction, the sum of their combined momenta exactly equaling the sum of the momenta of the two bodies before the collision, as nothing is ever lost in God's universe. It would eventually happen that out of all the motions in this nebula one would predominate, and finally brings all the other motions to coincide with it. When this stage is reached, the entire nebula begins to rotate slowly, and eventually assumes the spiral form.

Of 120,000 carefully observed nebulae about one-half are spiral, indicating that they have begun to rotate in a definite direction and are slowly assuming a definite form. The rotating nebulous mass constantly radiates heat, causing it to contract as it rotates. This contraction in turn develops more heat, so that the mass itself is not necessarily cooling. When, in the process of its evolution, a nebula has reached the spiral stage, it is no longer gaseous

⁷ *Lessons in Astronomy*, Charles A. Young, p. 168.

⁸ *The Earth's Beginning*, Sir Robert Ball, p. 352.

in character, and in many of the spiral nebulæ a nucleus, sometimes several nucleii may be seen, indicating that the process of condensation has so far advanced that a definite form has been evolved.

The dimensions of some of these spiral nebulæ are probably millions of times greater than the dimensions of the nebula from which our solar system was evolved, and it is thinkable that galaxies of stars, instead of one solar system, will be the eventual outcome of their evolution.

Dr. Roberts has been able, by means of the photographic plate, to determine the spiral form and development of many nebulæ that could not have been so classified by any other means at present known to science.

It is one of the laws of momentum that as a nebula cools and contracts it must rotate faster and faster, in order that the moment of momentum may be maintained. This increased rate of rotation leads to the separation or throwing off of large masses from its surface, and these detached masses revolve about the central mass in the same time as the central mass rotates on its axis.

These detached masses, when first thrown off, rotate on their axes in the same time that they revolve about the central mass, but as ages go on they contract and cool, and as a necessary corollary, rotate faster and faster on their axes, while they probably continue to revolve about their central sun in the same time as when first detached from it.⁹ It is these detached masses which eventually form the planets, which, while their surfaces cool off with comparative rapidity, retain an immense volume of heat in their interiors, which is slowly radiated. The contraction of the planet produces further heat, so that, for a time, though great quantities of heat are radiated, the planet does not necessarily grow cooler.

While these changes are taking place in the planets, the central sun is cooling and contracting, and consequently, in order to maintain its moment of momentum, it rotates

⁹ *The Earth's Beginning*, Sir Robert S. Ball, p. 252.

on its axis faster and faster. Thus, in our solar system, we have the record, if we read God's book correctly, of the times in which our sun has rotated on its axis at different stages of its evolution.

When the nebula from which our solar system was formed extended out as far as the orbit of Neptune, the farthest planet, it rotated on its axis once in 165 years. When it had contracted to the size of the orbit of Uranus, it rotated once in 84 years. When it had contracted to the size of the orbit of Saturn, it rotated once in 29.5 years; to that of Jupiter, once in 11.9 years. When it had further contracted to the size of the orbit of Mars, it rotated once in 1.5 years; to the size of the orbit of the Earth, it rotated on its axis in 1 year. When the size of the contracting sun was equal to the orbit of Venus, it rotated in $7\frac{1}{2}$ months, when to the size of the orbit of Mercury, in 3 months.¹⁰

The sun now rotates on its axis in 25 days, 4 hours and 29 minutes, and the time required is constantly diminishing as the size of the sun diminishes.¹¹ Its present diameter is about 863,000 miles, and its rate of contraction is about 4 miles in a century (some authorities think it is contracting about 8 miles in a century); and it is universally conceded that this contraction is the principal cause of the generation of solar heat, although the constant collision of the sun with meteors or shooting stars is another source of heat development which should not be overlooked. The number of these meteors is incalculable, though of course most of them are not of very great size if we may judge by those which have fallen on the earth. While the energy of the sun is constantly being exhausted, the process is so slow that no appreciable diminution has been detected since scientists have known how to estimate its various manifestations of power.

It has been calculated, probably with considerable ac-

¹⁰ *Lessons in Astronomy*, Charles A. Young, p. 189.

¹¹ *The Earth's Beginning*, Sir Robert Ball, p. 237.

curacy, that the contraction of our nebula down to the present bulk of the sun would develop 270,000 times as much heat as would be needed to raise a volume of water the size of the sun from freezing to boiling point.¹²

Various estimates have been made as to the probable time that will elapse before the sun will become so cold and non-luminous that it will be unable to maintain sufficient heat and light for the maintenance of animal and vegetable life on this planet.¹³ Professor Young estimates that 10,000,000 years will probably be the limit.

The density of the sun, which was originally so low as to be an almost negligible quantity, is slowly approaching that of the earth. If the density of the earth is represented by 5, that of the sun may be represented by 1.4. The outer parts of the sun are simply vapor or clouds and incandescent gases, but towards its centre the pressure of its enormous mass has solidified these gases.

In the days of Zophar the Naamathite, nothing was known of chemistry and such bodies as nebulae were not known to exist, and Zophar was unable to understand that any means could ever be devised by which man would know the nature of the points of light which he saw in the heavens. The spectroscope has enabled scientists to determine with considerable accuracy the composition of the heavenly bodies, and it has been found that the nebulae, the stars and the sun contain no elements not found also on this earth: thus God has written in His book that His universe is *one in reality*: one in composition and one in the laws which govern it.

The heat contained in the sun is so great that it contains no chemical compounds; each element exists by itself in the form of gas, showing no disposition to unite with any other. The number of elements found is about 80. The element helium was first discovered in the sun by means of the spectroscope, and for a long time was not

¹² *The Earth's Beginning*, Sir Robert Ball, p. 109.

¹³ *Lessons in Astronomy*, Charles A. Young, p. 169.

known to exist anywhere else in the universe, but by and by it was found in cleveite, discovered in Norway.

The solar spectrum and the spectra of nebulae show the presence of calcium in abundance. Calcium is also present in numerous combinations in our planet.

Carbon is abundant in the sun, as is shown by the solar spectrum, and in an incandescent condition is the source of the light and heat which are radiated.¹⁴

Immense tongues of flaming hydrogen gas, and calcium and magnesium heated to the point of vaporization, complete the greater portion of the composition of the sun which we see. Of course the vast interior is hidden from our gaze.

Violent explosions are constantly occurring from the body of the sun and immense masses are thrown out to great distances, and the theory has been advanced that these masses may be the comets which revolve about the sun in such enormous and peculiar orbits, and which sometimes leave our solar system, apparently never to return.

Various attempts have been made to illustrate the comparative sizes of the earth, planets and sun, and their comparative distances from each other and from the universe about us. Perhaps the illustration given by Sir John Herschel and quoted by Young¹⁵ is as correct and striking as any that we shall find: "Choose any well-levelled field. On it place a globe two feet in diameter. This will represent the sun. *Mercury* will be represented by a grain of mustard seed whose orbit is the circumference of a circle 164 feet in diameter, *Venus*, a pea on a circle 284 feet in diameter; the *Earth*, also a pea on a circle 430 feet in diameter; *Mars*, a large pin's head on a circle 654 feet in diameter; the *asteroids*, grains of sand on orbits having a diameter of 1000 to 1200 feet; *Jupiter*, a moderate sized orange on a circle nearly half a mile across;

¹⁴ *The Earth's Beginning*, Sir Robert Ball, pp. 69, 73.

¹⁵ *Lessons in Astronomy*, Charles A. Young, p. 204.

Saturn, a small orange on a circle four-fifths of a mile across; *Uranus*, a full-sized cherry or small plum on the circumference of a circle more than a mile in diameter, and finally *Neptune*, a good sized plum on a circle about two and a half miles in diameter." Professor Young adds that "on this scale, the nearest star would be 8,000 miles away."

Professor Newcomb gives an equally striking illustration: let the earth be represented by a grain of mustard seed, and the sun by a large apple at a distance of 40 feet; the other planets would range in size from invisible particles to a pea, at distances ranging from 10 feet to a quarter of a mile. Outside of this small area there would be a space as large as the whole continent of America which would contain no object except the wandering meteors.¹⁶

¹⁶ *Astronomy for Everybody*, Simon Newcomb, pp. 7-8.

CHAPTER III

God moves and works by laws, and in no other way does He work out the great problems of His universe. Nothing goes by chance and nothing is forgotten, and, at the appointed time, everything works out according to the original design. God is never in a hurry; a thousand years or a million years are but as one day or a watch in the night. No one can compute the millions of years that it has taken for our solar system to evolve from the primeval nebula to its present maturity, and no one can compute the centuries that will be required for the human race to evolve to that state of moral perfection towards which it is slowly but surely moving.

One of God's most obvious laws is the law of growth; everything grows, from the smallest and most imperfect beginning until the perfection designed has been reached, and then it grows old, declines and dies.

Our solar system has evolved from chaos to the orderly and symmetrical arrangement which science has revealed to us in these later centuries. Our earth has grown through countless æons of time from a molten, plastic mass of matter to a suitable sojourning place for humanity. The time will come when life can no longer be sustained on this planet, when it will have served its purpose in the great plan of God. What its ultimate destiny will be we know not.

Man has developed from a beast, through countless millenniums, into a physical being endowed with an intellect of wonderful power, but his moral nature has not yet developed much beyond that of the beast from which he sprang. But God's law of growth and progress never fails, and the time will come when men will live on this

earth under conditions of ideal moral and physical perfection, in spite of the theologians and dogmatists and their devil.

God is no economist as men count economy; He has plenty of time and is in no hurry: eternity will be soon enough for Him to complete any of His undertakings. Neither is God economical in His use of material; He does not hesitate to throw away, so far as we can see, thousands of His most perfect creatures, in the working out of what seems to us a small and simple problem. His ways are not as our ways. He has plenty of material, plenty of time, and He does not need an efficiency expert to show Him a better way.

Every step in the evolution of civil or religious liberty has been marked by the blood of thousands of human victims, and we are reminded that eternal vigilance and eternal conflict are the price of freedom. This law of battle, the survival of the fittest, seems to be fundamental in the vegetable, animal, intellectual, moral and spiritual kingdoms.

Evolution, which means development as defined by Lamarck and Darwin, is a fact accepted by all scientists today, and may be accepted as one of the laws of God. Perhaps all the rules which govern it are not yet formulated or understood, but little by little man will find them out.

The laws of physics, the laws which govern the transmission of light and heat, and inferentially the laws of sound, and the laws which govern moving bodies, apply not only on this planet but throughout all God's universe with no variations or exceptions. It is impossible for the ordinary mind, with only the training given by the curriculum of the modern university, to comprehend how such scientists as Kepler and Newton, Leverrier, Galle and Galileo were able to discover the laws governing the movements of heavenly bodies, and, having found them, to apply them with such unerring results. But the testi-

mony of scientists is sufficient to establish both the truth of these laws and the correctness of the conclusions drawn from them.

Kepler's first law is: *Planets revolve in elliptic orbits about the sun, which occupies the common focus of all their orbits.*

Kepler's second law is: *If a line be drawn from the centre of the sun to any planet, this line, as it is carried forward by the planet in its revolution, will sweep over equal areas in equal times.*

Kepler's third law is: *The square of the period of one planet is to the square of the period of another planet, as the cube of the distance of the first planet from the sun, is to the cube of the distance of the second planet from the sun.*

These laws were finally worked out by Kepler after years of study and computations, disappointments and failures, and the final triumph was delayed by errors in his reckonings.

Kepler was unable to explain the reasons for these laws which he had discovered, but when Sir Isaac Newton made his great discovery of the laws of gravitation, all was explained. Newton's laws explain all the motions of the heavenly bodies, enable science to predict those motions for centuries to come, and to tell what those motions have been in the remote past.

Sir Isaac Newton's laws may be stated as follows:

First: *If a body situated in space, free to move, be given an impulse sufficient to start it in motion, it will continue to move in a straight line, and with an unchanged velocity forever, if it be not affected by some other body.*

Second: *An alteration of motion is always in proportion to the force impressed upon the moving body, and is in the direction of a straight line in which that force is applied.*

Third: *Action and reaction are always equal.*

Perhaps the most important of Newton's laws was the following:¹

Every particle of matter attracts every other particle of matter in the universe with a force directly proportional to the quantity of matter in each and decreasing as the square of the distance which separates them increases.

These laws were not made by Kepler and Newton; they were laws of God, and they were "found out by searching." They had been laws through an eternal past, and will remain laws through an eternal future.

Philosophers and theologians were no more ready to accept the truth in Newton's time than they are today, and Newton was accused of everything except a love of truth and the possession of a scientific mind. Leibnitz accused him of introducing occult qualities and miracles into philosophy, and asserted that his² "laws of gravitation were subversive of natural and revealed religion."

There is a law governing the distances of the planets from the sun which is called³ Bode's law, for the astronomer who discovered it. What reason there is in dynamics for the existence of this law is not known, but its existence is another proof of the orderly arrangement of the universe, showing that things are not going haphazard, as we are sometimes disposed to think, but are following an orderly plan and moving steadily toward a definite end.

Bode's law is as follows: ⁴ Take the numbers 0, 3, 6, 12, etc., doubling each as we go along. Then add 4 to each number and we shall very nearly find the scale of the distances of all the planets from the sun, except Neptune. The distance of the earth from the sun is taken as the unit of measure, consequently the figures in the following table are divided by ten, by placing a decimal point at the left of the right-hand figure.

¹ *Astronomy for Everybody*, Simon Newcomb, p. 154.

² *Origin of Species*, Charles Darwin, p. 496.

³ and ⁴ *Astronomy for Everybody*, Simon Newcomb, p. 154.

Mercury ..	0	+	4	=	.4	Actual distance from sun	.4	
Venus	3	+	4	=	.7	"	"	.7
Earth	6	+	4	=	1.0	"	"	1.0
Mars	12	+	4	=	16	"	"	1.5
Asteroids...	24	+	4	=	28	"	"	2.0 to 4.0
Jupiter	48	+	4	=	52	"	"	5.2
Saturn	96	+	4	=	100	"	"	9.5
Uranus ...	192	+	4	=	196	"	"	19.2
Neptune ..	384	+	4	=	388	"	"	30.0

By taking these distances as found in Bode's law, and applying to them Kepler's third law, we can find how long it will take each planet to revolve in its orbit around the sun.⁵ "Suppose one planet to be four times as far from the sun as another. It will then be eight times as long going around it. This number is reached by taking the cube of four, which is sixty-four, and then extracting the square root, which is eight."

When the outer planets, like Neptune and Uranus, were thrown off from the primeval nebula, the nebula was rotating slowly, and these planets have maintained the same rate of motion as was imparted to them at that time. So these outer planets not only have much farther to go in their orbits about the sun, but they move much more slowly, it requiring Neptune about 164 years to complete the revolution.

Anyone who has watched a grindstone, to which an abundance of water has been applied, turning rapidly, has observed that the drops of water which fly off from its circumference revolve in the same plane as the stone revolves; so the planets thrown off by the great rotating nebula, revolve in nearly the same plane as the equator of the nebula.

The plane of the earth's orbit is called the ecliptic, and all the planets and all their satellites, with the exception of the satellites of Uranus and Neptune, revolve in planes very closely approximated to the ecliptic.⁶ The plane of

⁵ *Astronomy for Everybody*, Simon Newcomb, p. 156.

⁶ *The Earth's Beginning*, Sir Robert S. Ball, p. 208.

the orbit of Mercury is inclined seven degrees to the plane of the ecliptic, and this is the greatest inclination of any of the orbits of the planets.

Of the seven hundred asteroids, seventy-five per cent. of the orbits have inclinations of less than ten degrees. As these asteroids perhaps represent an exploded planet, or else were thrown off from their central mass under evidently peculiar conditions, it is not strange that the planes of their orbits should not yet coincide with the ecliptic. They, as well as all the planets, will gradually approach the same plane, as the laws of momentum and gravitation admit of no other result. The satellites of Uranus and Neptune will slowly work around to the same plane.

It is to be further noticed that the planets and satellites not only revolve about the sun in very nearly the same plane, but all of them also in the same direction, and the axis of the sun is nearly perpendicular to the plane of the ecliptic. All of these facts seem to point to the truth of the nebular hypothesis.

While most of the comets revolve about the sun, none of them show any tendency to conform their orbits to the plane of the ecliptic; seeming to indicate that they originated from explosions in the body of the sun and were thrown out in various directions wherever the force of the explosion was pointed, and were not, like the planets, separated from the central mass by the centrifugal force developed by its rotation.

While the laws of momentum and gravitation require that the planes of the orbits of all the planets and all their satellites must eventually coincide, making one common plane, the time required to bring this about is beyond our power to compute.

It must be remembered that the planets are not only attracted by the sun according to the laws of gravitation, but that they influence each other directly in proportion to their mass and inversely as the square of the distance

which separates them increases. These latter influences cause all the planets and satellites to change their courses more or less. Elliptical orbits grow more and more elliptical, and then slowly change their shape until they become nearly circular, until at some remote period millions of years in the future, they will all be in the same relative position that they are at present. This is one of the great clocks of eternity which is marking off the time for God.

The earth, in its journey round the sun, is being constantly drawn out of the plane of the ecliptic by the moon, and is often some hundreds of miles either above or below that plane; she sways from side to side much as a drunken man oscillates from side to side on a narrow sidewalk which he is trying to follow.

Astronomy has cognizance of eight planets;⁷ probably there are no more, though it has been hinted that there might be a small planet revolving inside the orbit of Mercury. Between Mars and Jupiter there are about seven hundred little planets, called asteroids, which behave in all respects like planets.

The following table, copied and adapted from Young,⁸ gives at a glance the principal data relating to the planets:

Distance in Astronomical Units from the Sun	Periods of Revolution	Diameter	Number of Moons
MERCURY....	0.43 months	3,000 miles	None
VENUS.....	0.7 7½ months	7,700 miles	None
EARTH.....	1. 1 year	7,918 miles	One
MARS.....	1.5 1 yr., 10 mos.	4,200 miles	Two
ASTEROIDS...	3. 3 yrs. to 9 yrs.	10 to 500 miles	None discovered
JUPITER....	5.2 11.9 years	86,000 miles	Eight
SATURN....	9.5 29.5 years	73,000 miles	Ten and 3 rings
URANUS....	19.2 84 years	32,000 miles	Four
NEPTUNE....	30.1 164.8 years	35,000 miles	One

The moon, which accompanies our earth on its journey through space, is about 238,840 miles away, the distance varying a little from time to time. It seems probable that

⁷ *Astronomy for Everybody*, Simon Newcomb, p. 244.

⁸ *Lessons in Astronomy*, Charles A. Young, p. 189.

the moon did not separate from the earth until the mass had cooled to a plastic or semi-solid state, and its surface consequently soon became rigid, so that its bulk did not decrease much as the cooling process continued. The moon, therefore, continues to rotate upon its axis in essentially the same time as its mother earth was rotating at the time of the satellites' birth—that is, in the exact time that it performs its revolution about the earth. As a result the moon always shows the same surface to the earth.⁹

It seems probable that the moon revolves about the earth in a shorter period now than in the time of the Babylonian astronomers. This seems to be indicated by the records of eclipses, and is corroborated by Arabian astronomers in their ancient records, and in the middle ages.

The orbit of the earth's revolution is slowly changing from an ellipse and approaching the form of a circle. After millions of years it will slowly change back again to the more pronounced elliptical form, and this explains the change in the time of the revolution of the moon about the earth.

In 3,000 years the moon has advanced four of her diameters beyond the point where she would be had there been no acceleration of her speed. This acceleration will continue as long as the orbit of the earth continues to change toward the form of the circle; but when the limit of circularity has been reached the earth's orbit will slowly become elliptical, and at the same time the moon's speed will gradually slacken until the orbit of the earth reaches the limit of its elliptical form. This is another of the great timepieces of the Creator; millions of years are consumed in this one revolution of the hands of God's clock, and are we not justified in calling this period of time one of God's days?

This great clock of God was wound up untold millions

⁹ *The Planetary and Stellar Worlds*, O. M. Mitchell, pp. 112-115.

of years ago when the great collision occurred which produced the nebula from which our solar system has evolved; the clock is slowly, but surely, running down, and at some time in eternity it will stop.

As the mass of the moon is only about one-eightieth of that of its mother earth, it cooled much faster; consequently, we find no atmosphere and no vapor of water surrounding it: these have been condensed into solids by the intense cold. This condition is a prophecy of the conditions which will eventually prevail on this earth. There is every evidence to convince us that in its youth and early maturity the moon was torn by violent explosions and terrific volcanic activities. Immense craters are observable all over its surface in apparently the same condition as they were when left by volcanic action. As the result of this volcanic action and the warping and folding of its crust as the cooling and contracting process progressed, immense mountains were formed. The moon's surface shows over seven hundred mountains whose height exceeds 6,500 feet, and some are as high as 24,000 feet. The color of the moon should be described as yellow, grey and dark green, the reflection from volcanic products.¹⁰

Of course, what is on the other side of the moon, the side that is never turned toward the earth and which man can never see, we can only conjecture; perhaps it does not greatly differ from the side that is turned forever toward us.

The moon cooled so rapidly that the gases which formed its atmosphere were undoubtedly the same as ours, and its waters were perhaps condensed into solids and immovably fastened in its substance before they had time to erode and scrape and disintegrate and polish and completely change its surface, as these elements have done to the surface of the earth. As we look at the surface of the moon we may form some conception of the appear-

¹⁰ *The Destinies of the Stars*, Arrhenius, p. 244.

ance of our earth as it was emerging from primeval chaos.¹¹

As an illustration of some of the difficulties encountered in attempting to read and understand and explain God's book, it should be mentioned that the absence of an atmosphere about the moon has been explained in a very different way by Arrhenius, who concludes that on account of the small bulk of the moon it did not possess sufficient attraction or holding force to retain the gases out of which an atmosphere is made, and that these gases, therefore, escaped into space and were probably attracted back to the sun, or possibly to our earth.¹²

The terrific volcanic action, which must have continued on the moon for a time measured by a geologic period at least equal to that which our igneous rocks denote, undoubtedly emitted immense volumes of gases, of the presence of which on the moon there is now no evidence. The same theories would explain the absence of atmosphere about the asteroids.

Our solar system, the sun with the planets and their satellites, is moving through space in a straight line toward the constellation Lyra ¹³ at about the rate of 1,000,000 miles a day, and has been so moving for time beyond computation.¹⁴ Man "by searching" has learned to compute the amount of energy which this great velocity and immense weight of matter represents. One-half the mass multiplied by the square of the velocity represents the amount of energy, and this energy is never diminished or lost, for motion of matter and consequent energy are eternal.

¹¹ For pictures of lunar craters see *The Earth's Beginning*, Sir Robert Ball, p. 255. For pictures of lunar craters see *The Origin and Evolution of Life*, Henry F. Osborne, p. 30.

¹² For photographs of moon see *The Destinies of the Stars*, Arrhenius, p. 242.

¹³ *Astronomy for Everybody*, Simon Newcomb, pp. 325-326; 237-238.

¹⁴ *The Earth's Beginning*, Sir Robert S. Ball, p. 352, says: "One-half of a million miles a day."

The planets Mercury and Venus revolve about the sun inside the orbit of the earth, and not very much is known about them. The exact length of their day is uncertain; it seems probable that they rotate on their axes in the same time that they revolve about the sun. If this be true, it indicates that they have not greatly cooled nor contracted since they were thrown off from the central sun.

As their orbits are inside that of the earth they always appear either as morning or evening stars; in other words, they are always a little ahead of or a little behind the sun, as viewed by us. Because they shine by reflected light, and because they are constantly changing their positions with relation to the earth, they exhibit all the changing phases which we see in the moon. These changing phases can only be *seen* by the aid of a telescope, though they were *foreseen* and predicted by Copernicus.

It was permitted to Galileo in 1610 to be the first of Adam's race to see through his little telescope these changing phases: "There are occasions in life when great minds live years of rapt enjoyment in a moment. I can fancy the emotions of Galileo, when, first raising the newly constructed telescope to the heavens, he saw fulfilled the grand prophecy of Copernicus, and beheld the planet Venus crescent like the moon. * * * * Yes, noble Galileo, thou art right. It does move. Bigots may make thee recant it: but it moves nevertheless. * * * The inquisition may seal thy lips, but they can no more stop the progress of the great truth propounded by Copernicus and demonstrated by thee than they can stop the revolving earth. Close now, venerable sage, that sightless, tearful eye. It has seen what man never before saw: it has seen enough. Hang up that poor little spy-glass: it has done its work. Franciscans and Dominicans deride thy discoveries now, but rest in peace, thou great Columbus of the heavens, scorned, persecuted, broken-hearted. In other ages, in distant hemispheres, when the

votaries of science, with solemn acts of consecration shall dedicate their stately edifices to the cause of knowledge and truth, thy name shall be mentioned with honor.”¹⁵

Recent studies and observations have added to our knowledge of this celestial neighbor. The humidity of Venus is six times the average humidity of the earth and three times that of the Congo region in Africa. Everything there is soaking wet. The excess of moisture and the large amount of carbon dioxide keep the temperature about even from pole to pole, forming a blanket over the entire planet, so that we do not see its surface, but only the clouds that envelop it. The vegetation is undoubtedly tropical,¹⁶ much like that of ours in the carboniferous age. Venus is young, and may in the course of æons evolve to a condition similar to our earth's in historic times.

While Venus is our nearest neighbor toward the sun, Mars is our nearest neighbor on the other side, being at times less than 36,000,000 miles away. Its diameter is only a little more than half that of the earth, and it rotates on its axis in 24 hours, 37 minutes, 22 seconds. Many are the theories that have been advanced concerning this neighbor of ours, many of which must still be considered only as theories, for scientific men are not agreed concerning them. But its nearness makes observations with the telescope much more satisfactory than those made upon any other planet.

Mars apparently has a snow and ice cap at each pole, exactly as we have on our earth, and these ice caps partially melt each summer as the pole is turned toward the sun; this fact is proved by the reduced surface covered by the ice cap as the summer advances. Atmospheric disturbances which are supposed to be snowstorms, are frequently seen, and dust storms on the deserts.

Mars has two small moons which revolve about it with

¹⁵ Address by Edward Everett, delivered at Albany, N. Y., August 28, 1856.

¹⁶ *The Destinies of the Stars*, Arrhenius, p. 250.

tremendous speed.¹⁷ One of them, which is only 5,800 miles away, moves from west to east so rapidly that it rises in the west and sets in the east. It makes its complete revolution about the planet in 7 hours, 39 minutes.

It has been claimed for many years by eminent astronomers, that there are evidences that Mars is inhabited by intelligent beings, perhaps not very different from ourselves. In proof of this, our attention is directed to certain lines on the surface of Mars believed to be canals, probably for irrigation purposes, which seem to be laid out with great regularity and engineering skill, and which are supposed to be for the purpose of conveying water from the melting snow and ice about the poles to the arid regions toward the equator. Giovanni Virginio Schiaparelli, an Italian astronomer, and Professor Percival Lowell, an American astronomer, are the two most ardent champions of this theory. Certain appearances along the borders of these canals, especially during their summer months, are supposed to indicate growing vegetation; and if these lines are canals, they must certainly be of artificial construction. These matters are not yet agreed upon by scientists, and for the present we must suspend judgment.

Mars is so much smaller than the earth, and probably was separated from the sun so long before the earth, that it is much colder than our planet and possesses a more rarefied atmosphere, so that it could hardly be a suitable place for animal life such as we know and are able to study. It may be that Mars is reaching a point in its evolution which we shall reach in a far distant future, where animal and vegetable life are maintained with increasing difficulty and where they may relatively soon become extinct.

Between the orbits of Mars and Jupiter it was long ago recognized that a planet should be found, as Bode's law required that such a body must exist; but it was not until

¹⁷ *Lessons in Astronomy*, Charles A. Young, p. 222.

the dawning of the nineteenth century that the apparent absence of this planet was explained. Instead of one large planet, moving in an orbit closely approximating that required by Bode's law, there were discovered about 700 small planets, with diameters varying from about 10 to nearly 500 miles, and moving in very eccentric orbits. Some of them at times approach nearer to the sun than the planet Mars, and some of them at times go so far from the sun as to approximate closely the orbit of Jupiter. There are periods when one of these asteroids, Eros, approaches to within 13,500,000 miles of the orbit of the earth,¹⁸ and its period of rotation on its axis has been calculated as $5\frac{1}{2}$ hours. About this latter statement there is perhaps some doubt.

It is probable that not all of these little planets, or asteroids as they are called, have as yet been seen. The smallest discovered have a diameter of only about 10 miles, and there is every reason to suppose that there may be others much smaller in size, which, perhaps, cannot be detected by any means at present at the disposal of science. The orbits of many of them have not been thoroughly traced out, as they are extremely erratic and their small size makes them difficult of observation. That all of them rotate on their axes there can be no doubt, but the times of rotation, except in the case of Eros, may never be determined, and the angles which their bi-polar axes make to the plane of the ecliptic may never be measured.

How did it happen that, instead of one large planet moving in its proper orbit between Mars and Jupiter, where Bode's law would place it, these seven hundred, and probably more, minute wanderers were developed? Science has two answers, neither of which may be correct, although one seems quite probable. As God has plenty of material and unlimited time, a miscarriage in the birth of a planet is of no importance to Him. Other

¹⁸ *Lessons in Astronomy*, Charles A. Young, p. 229.

planets with other suns to warm and light them will be born whenever and wherever He decrees. "His everlasting thought moves on His undisturbed affairs."

One theory accounting for the development of these asteroids is that a large planet, moving in the orbit indicated by Bode's law, exploded from some cause which we cannot explain, and that these asteroids are the fragments. Also that the erratic character of their orbits is largely due to the force imparted to them by this explosion. The laws of momentum will eventually function to bring all their orbits to conform with the plane of the ecliptic.

Another and more probable theory is that the great mass of the planet Jupiter, which is 88,000 miles in diameter and which is next outside the orbits of these asteroids, was able, by its power of attraction, to tear in pieces the forming planet before it had reached the spherical stage, while it was still a gaseous or fluid mass, perhaps still a gaseous ring around the central sun. This latter theory stands the tests of scientific inquiry fairly well, and must answer for the present, 'til some Newton, Bode or Kepler, in the ages to come, determines the solution of this problem beyond discussion.

Jupiter is the great planet of our solar system. If there is some reason to believe that Mars may be inhabited by intelligent beings not greatly different from ourselves, there is no possibility, so far as we can judge, that any form of vegetable or animal life can exist on the planet Jupiter, owing to its exceedingly high temperature and to the fact that it has not as yet cooled down to the point where it is a solid body. Apparently it is a semi-solid or partly gaseous body, and what we see of it is mostly the clouds of vapor which surround it, partly composing its atmosphere.

It has long been supposed by some observers, that Jupiter was self-luminous, but this is doubtful: it shines by reflected light, and its self-luminosity, if existent, is

certainly very feeble. It is not only the largest of the planets, but larger than all the others and their satellites combined. Its diameter is 88,000 miles; its surface 122 times that of the earth, its mass 316 times that of the earth, and its volume 1,355 times that of the earth.¹⁹ Its mass, though it is so great, is only about 1/1048 that of the sun. Its mean distance from the sun is 483,000,000 miles, and it revolves about the sun in 11.9 years. This immense body rotates upon its axis in 9 hours, 55 minutes, which is the most rapid motion found in the rotation of any of the planets, and amounts to only a little less than 9,000 miles an hour at its equator. This apparently indicates that Jupiter has greatly contracted in size since it separated from our central sun, and we may be sure that as it further contracts and cools it will increase the rate of its motion on its axis. Jupiter, when in opposition, is about 390,000,000 miles from the earth, and when in conjunction about 580,000,000 miles from the earth.

Jupiter has eight moons, possibly more, which vary greatly in size, in their periods of revolution and in their distances from their mother planet. To Galileo belongs the honor of seeing, through his little telescope, what the eye of man had never seen before. In January, 1610, he discovered four of the moons of Jupiter and noted their revolutions about their planet; no other satellite was discovered 'til 1892, which indicates how close an observer was this great "Columbus of the Heavens." The sixth and seventh satellites were discovered in 1905, and the eighth in 1908.

The four satellites discovered by Galileo vary in diameter from 2,000 miles to 3,600 miles, and their distances from Jupiter vary from 169,000 to 262,000 miles. The outer one of these four requires 70 days for its revolution. The fifth moon is very difficult of detection and has been seen by comparatively few people, both on account of its small size and its peculiar appearance and

¹⁹ *Lessons in Astronomy*, Charles A. Young, pp. 232, 233, 234.

its closeness to the mother planet. It is less than 100 miles in diameter and is distant from Jupiter 112,500 miles. It makes a complete revolution about the planet in 11 hours, 57 minutes, 22 seconds, which time is only reduced by the inner satellite of Mars, which revolves about its planet in 7 hours, 39 minutes. The sixth and seventh satellites are even smaller than the fifth, but instead of revolving in a few hours, require several months to make the circuit of their orbits. The eighth moon of Jupiter, which was not discovered until 1908, is distant from Jupiter 16,000,000 miles. These eight moons, which have such various times of revolution, may be frequently seen passing across the face of the planet and casting their shadows upon it; they also pass behind it into eclipse. Their various times of revolution are appointed for them by the laws of moment of momentum.

There are certain resemblances between Jupiter and the sun. Jupiter, while not so hot as the sun, is still more than boiling hot, and is in a fluid or gaseous state, possibly to some extent self-luminous. With its satellites it constitutes more than half the bulk of the planetary system, and the number of its satellites is the same as the number of the planets. If Jupiter had taken five hundred times more of the bulk of the sun when it separated from that luminary, we should have had two suns in our system of planets instead of one, a condition which apparently exists in numerous systems in the heavens.

The planet Saturn was for many centuries supposed to mark the outer limit of our solar system; but little more than this was known about it until 1610, when Galileo with his "little spy glass" discovered what looked to him like handles on either side of the planet. These "handles" he was unable to identify, and he feared that he had been in some way deceived, or that his mental condition was responsible for an error in observation. In fact, he had again seen what man never saw before: he had seen the

rings of Saturn, but he died before the exact nature of the "handles" was accurately determined.

It was 240 years after Galileo first saw them before the third ring was definitely differentiated from its fellows and astronomers were prepared to concede that there were three concentric rings about this planet. Much has been learned about them since that time, but, as they are unique in all the universe so far as we know, there remains much to be found out by searching. The existence of a third inner ring has been questioned, and it is claimed on high authority that what has been considered the third or inner ring is, in fact, a part of the second ring. The outer ring ²⁰ is about 1,200 miles wide; is separated from the next inner ring by approximately 2,000 miles. The second ring is about 17,000 miles wide, and the inner ring 10,000 miles wide. Between the inner ring and the equator of the planet there is a distance of approximately 8,000 miles.

These rings all revolve in the same direction as the planet, from west to east, and in the plane of the equator. Their thickness is less than 100 miles. It seems as if these rings of Saturn might bear the same relation to Saturn's moons that the asteroids bear to the planets. They contain the makings of a satellite perhaps (we are not entitled to say probably); eventually they may be assembled and condensed into two or three moons, after the planet has greatly cooled and contracted. It seems possible that we have in these rings an exhibition, before our very eyes, of the way planets and moons are made, or at least, as in the case of the asteroids, we are able to observe how some of the forces of nature appear to defeat the primary objects of the Creator.

The planet Saturn is the least dense of all the planets, being less than water.²¹ It is exceedingly large, with an

²⁰ *Astronomy for Everybody*, Simon Newcomb, p. 213 and following. *Lessons in Astronomy*, Charles A. Young, p. 242.

²¹ *Lessons in Astronomy*, Charles A. Young, pp. 239-240.

equatorial diameter of 75,000 miles, and it rotates on its axis very rapidly, completing rotation in 10 hours, 14 minutes. The mass and density of the rings are small, and it would seem natural that a planet which is more than boiling hot and whose density is so small and which is rotating so rapidly, would throw off from its surface the vapors and gases which must of necessity rise to its surface. These vapors and gases, when they had cooled a little, would have made a cloud such as the steam cloud which we often see following a rapidly moving locomotive. This cloud would follow along in the direction given it by the planet which threw it off, and by the laws of gravity would continue to rotate about that planet. Perhaps this explains the formation and existence of these rings. What their future will be and their ultimate destiny, no man can tell.

Saturn appears to us as one of the largest stars, and shines with a bright yellow light. Its average distance from the sun is 886,000,000 miles, and its distance from the earth varies from 774,000,000 to 1,028,000,000 miles. Its orbital plane is inclined to the plane of the ecliptic only $2\frac{1}{2}^{\circ}$. It revolves about the sun in 29.5 years.²² As might be expected in a planet of so little density, such intense heat and so rapid a rotation on its axis, Saturn has more satellites than any other planet, ten in all, so far as have yet been discovered. It seems probable that there are others not yet discovered because of their small size and great distance from us; at least there is little reason to assume that astronomers have found them all. From the time of the discovery of the first until the tenth was recognized was a period of 243 years. These moons vary greatly in size, the tenth having a diameter of approximately less than 200 miles, and Titan, the largest, having a diameter of approximately 4,000 miles, and their distances from the mother planet vary from about 100,000 to 8,000,000 miles, and the periods of their revolution about

²² *Lessons in Astronomy*, Charles A. Young, pp. 239-240.

their planet vary from twenty-three hours to eighteen months. The rings are inside the orbit of the nearest satellite, and evidently are a later development in the process of evolution in and about the planet. Is it not possible, indeed is it not very probable that other rings and other satellites may yet be thrown off by this rapidly rotating, boiling, steaming planet?

The planet Uranus and its four satellites have been looked upon with special interest by astronomers for many years, especially as the revolution of the satellites about their planet seemed to upset and contradict the nebular hypothesis of Laplace. These apparent contradictions seem to have been satisfactorily explained, however, and the nebular hypothesis upheld.

Uranus was discovered by Sir William Herschel in 1782; though Herschel and other observers had seen it before, they had, up to that time, failed to realize that it was a planet and not one of the smaller fixed stars. Its period of revolution about the sun is 84 years, and its distance from the sun is from 1,700,000,000 to 1,800,000,000 miles. It has a diameter of about 32,000 miles, perhaps a little less. On account of its great distance, and the absence of any striking markings on its surface, it has been impossible so far to determine the time of its rotation on its axis. Its bulk is about 66 times that of our earth. Not long after his discovery of the planet in 1782, Sir William Herschel discovered two satellites, after which it was supposed for a time that there were six in all. But in 1851 it was definitely decided that there were only four, the second pair being discovered in that year by Lassell. None of these moons is very large, and two of them can only be seen by the largest telescope and under the most favorable conditions.

The satellites of Uranus all revolve about the planet in the "wrong direction" and in the same plane, which is probably the plane of the planet's equator, and at a very rapid rate. The times of their revolutions vary from 1

day, 12 hours, to 13 days, 11 hours, and their distances from the planet from 120,000 to 375,000 miles. The times of their rotation on their axes cannot be determined.

In the rings of Saturn is found something unique in the planetary system, perhaps simply a different and earlier stage in planetary evolution from anything observed elsewhere, and science has thus far not been able to explain satisfactorily these phenomena. So also in the motions of the satellites of Uranus and Neptune are found phenomena which it has taxed the ingenuity and learning of scientists to explain. All the other bodies in our solar system rotate on their axes from west to east and in approximately the same plane, which is called the plane of the ecliptic, and is the plane of the earth's orbit.

All the planets revolve about the sun in the same direction and in approximately the same plane, and all the satellites except those of Uranus and Neptune revolve in the same direction, from west to east, and in planes closely approximated to the plane of the ecliptic. Some of the asteroids depart quite widely from this plane, probably due to the exceptional forces which produced them.

The four satellites of Uranus revolve about their planet in a plane which is inclined to the plane of the ecliptic 83° , or nearly at a right angle, and it seems probable that the plane of the equator of the planet is inclined to the ecliptic by the same angle. The planet probably rotates from east to west, though this has not been proved by observation, as there are no objects or markings on the surface by which its rotation can be accurately determined. The question which has puzzled scientists is: why do these satellites of Uranus and Neptune revolve about their planets from east to west, or perhaps more accurately, from north to south? The answer seems easy. These planets mark the outer limits of our solar system, and were separated from the primeval nebula early in its evolution, while it was probably still in a gaseous state.

The countless motions which were imparted to the atoms of this nebula by the tremendous force of the collision which gave it birth had not yet been unified by the laws of moment of momentum, and had not been brought to operate in planes closely approximated to each other. The great nebula was rotating very slowly; it was still in the spiral form; it had not yet assumed a definite axis about which to rotate; it was an accumulation of contradictory motions which were ultimately to be brought into one plane and to operate in one direction. While the nebula was in this chaotic state, the immense volumes of vapors or gases from which Uranus and Neptune were formed became separated from the central mass with all sorts of contradictory motions within them. The central nebula had not yet developed sufficient character in its motions to be able to impart that character to its offspring, so like naughty children, they turned over in the wrong direction, and their satellites, as they could not do otherwise, have followed in the same direction. These planets revolve about the sun in the same direction and in approximately the same planes as all the other planets. They cannot escape from the laws of gravitation or moment of momentum, and it seems inevitable that all their satellites must finally be brought into the same plane as all the other planetary bodies, and rotate and revolve in the same direction. These anomalous motions simply represent an early stage in planetary evolution, and, like the rings of Saturn, enable us to see the various steps and methods by which God makes His worlds.

The planet Neptune, like its neighbor, Uranus, has peculiarities of motion found nowhere else except in these two planets. Its satellite, like that of Uranus, revolves from east to west, though the plane of its revolution approaches more nearly to the plane of the ecliptic. It is inclined to this plane $34^{\circ} 48'$,²³ which is undoubtedly the inclination of the plane of the equator of the planet.

²³ *Lessons in Astronomy*, Charles A. Young, p. 250.

Perhaps the most interesting thing about this planet is the history of its discovery, which was a triumph of pure mathematical skill such as the world had never before seen. It had been observed that the planet Uranus did not keep to its orbit, and did not arrive at given points on the times appointed for it by astronomers. It had been suspected that there might be a planet outside its orbit, but no astronomer could find it. A young French mathematician named Leverrier figured out, from variations in the orbit of Uranus, just where this suspected planet should be, but as he had no sufficiently powerful telescope, he wrote to astronomers in Berlin directing them where to look for it in the heavens, and assuring them that at this point they would find it. The planet was found by Galle at the point indicated by Leverrier within half an hour after the search was commenced on the evening of September 23, 1846. No greater triumph of the human mind than this has ever been recorded. This was a case where some of the ways of God were found out by *searching*, which could have been found in no other way, for this planet was outside the range of the unaided human eye, and its existence could never have been suspected except as the result of the application of the principles of pure science.

Another interesting feature about Neptune is that its place in the heavens is not where we should expect to find it under Bode's law. It is 800,000,000 miles nearer the sun than this law indicates it should be.²⁴ An English astronomer, Adams, is entitled to equal credit with Leverrier for the discovery of this planet, for, at the same time and by the same methods, he had made the same discovery, but the matter was not announced publicly to the scientific world and it was known only to some of his immediate associates. The planet Neptune is about 33,000 miles in diameter; its volume is 60 times that of the earth;

²⁴ *Lessons in Astronomy*, Charles A. Young, pp. 249-250.

it revolves about the sun once in 164 years, and its distance from the sun is 2,800,000,000 miles.

About four weeks after the discovery of Neptune, a moon was discovered by Lassell. It is distant from the mother planet 222,000 miles, and revolves about it in 5 days, 21 hours. It is probably about the size of our own moon.

The sun would not appear to an inhabitant of Neptune, if there were such an inhabitant, as the dazzling orb which we see, but much fainter and smaller.²⁵ It has been estimated that the amount of light which the planet receives from the sun is about equivalent to that which the earth would receive from 700 full moons, so we may judge that the planet is not shrouded in darkness.

Are there other planets outside the orbit of Neptune? Probably not. Neptune and the other planets do not show those perturbations in their orbits which would indicate the presence of another planet, and the fact that Neptune is 800,000,000 miles nearer the sun than we should expect, according to Bode's law, would seem to indicate that there is no outside, attracting, steadying force to hold the planet away from the sun. The attracting bodies are all inside its orbit.

These planets and their satellites, and all the things that men have been able to find out about them by study and searching, take up many pages in the book which God is writing, but we are able to understand that they make but a small part of that great book. Nevertheless, they furnish the key by which many of the other pages may be translated.

It has been found that light travels about 12,000,000 miles a minute, or 196,000 miles a second. It takes light about 8 minutes to come to us from the sun, about 40 minutes from Jupiter, and about 4 hours from Neptune. So when we look at Neptune we see it not where it is, but where it was four hours before.

²⁵ *Lessons in Astronomy*, Charles A. Young, pp. 249-250.

It seems probable that the inter-stellar spaces contain innumerable dark bodies moving in all directions, most of them not of great size. With these our earth is constantly coming in contact. The origin of most of these bodies is beyond conjecture; they come from the depths of space and, if they do not collide with other bodies, continue their flight through all eternity.

It was contended by Sir Norman Lockyer that all the heavenly bodies, or at least our entire solar system, were either meteors or their accumulation or condensation.²⁶ Some of these dark bodies are undoubtedly very large and are moving at a tremendous rate. If one of them should collide with our earth or sun it would settle for all time the problems which perplex the sons of men. That these catastrophes occur not infrequently among the distant stars is abundantly evidenced in the heavens, and there is no reason why our solar system may not meet this experience at any indefinite date.

Millions of shooting stars or meteors strike our atmosphere every day, and may be seen almost any evening by those who care to look for them. Most of them burn out long before they reach the surface of the earth, as they are ignited by contact with the atmosphere at a great height; but some are so large as to fail of complete combustion and reach the earth as masses of rock or iron. Some of these masses of meteoric iron weigh many tons. These are the bodies which the ancients said "fell down from Jupiter," who was the great god and father of all gods and men. Burned out meteors have been known to descend to the earth as small masses of light ashes, ready to be blown away by the slightest gust of wind.

There has been much speculation as to the physical character of comets, but it seems to be fairly well established that they consist largely of small particles of solid matter illuminated by the sun, of which some of our meteors and shooting stars are stray samples.

Professor Newcomb has called comets "gravel banks"

²⁶ *Lessons in Astronomy*, Charles A. Young, pp. 293, 353-358.

and others have styled them "dust clouds," both of which terms seem correct and appropriate. It is claimed on good authority that the meteoric showers which were witnessed in 1855-1872-1892-1898 were due to the fact that the earth was passing through the tail of Bielas' comet. A piece of meteoric iron which fell in northern Mexico in 1885 has been confidently claimed by competent scientists to be a piece of Bielas' comet.²⁷

Some of the comets are absent from our solar system for long periods and can have little to do with our frequent meteoric showers.²⁸ Mitchell computes that the comet of 1811 has a period of 3,000 years, and that its distance from the sun varies from 80,000,000,000 to 160,000,000,000 miles.

It has been observed that many meteors have a regular orbit about the sun, in fact behave like little planets, and that the earth passes through this orbit during the latter half of November in each year, at which time meteors and shooting stars are most frequently seen.

A consideration of our sun and the planets, with their satellites, which revolve around it, will certainly inspire reverence and awe in any intelligent mind. As the laws which govern these moving bodies are more perfectly understood, and their origin and destiny are revealed to the searching mind, that reverence and awe will be increased in proportion as the mind and soul of the observer are able to grasp the infinitude of the Creator, and appreciate the wonderful works of His hand.

If men in crude and barbarous ages, who had little knowledge of these heavenly bodies and no conception of what they were, were filled with awe at their contemplation, should not we, who have inherited so much from the toil and study and persecution of the men of science, be filled with reverence, not only when we contemplate the heavens, but when we turn our thoughts from His works to the great Architect and Builder of this universe.

²⁷ *Lessons in Astronomy*, Charles A. Young, p. 290.

²⁸ *The Planetary and Stellar Worlds*, O. M. Mitchell, p. 189.

CHAPTER IV

Men, the holiest and best of men, have unconsciously made their God a little God, "the God of the whole earth," as if that were any adequate measure of greatness. This was unavoidable while men knew nothing of God's universe and could only study Him in those manifestations of Nature which were close about them. Poets and seers, in an ignorant age and in the crudest civilizations, have occasionally been able to rise above the barbarities about them, and like Socrates and Plato, dream of a great republic where all things would be well. But these wise and good men had little conception of spiritual values, and no conception of a deity who had any interests or powers beyond this earth. Even writers of ancient Hebrew literature had little idea of a God greater than a God of the whole earth, though His glory was in the heavens; but of those heavens they knew nothing.

Modern scientists have opened up many pages of God's book written in the stars, so far away that no human mind can comprehend the distance. In many cases the scientists have been able to read these pages and really comprehend what is written. Hundreds of these devout men, in all departments of science and all over the earth, are slowly spelling out the marvelous things which God has put down in His book. To us these things are great, but to Him there is nothing either great or small.

Our sun, with its attendant planets, is moving through space at approximately one million miles a day, and has maintained this velocity for untold æons, yet it does not perceptibly change its position in the heavens because the distances are so vast that millions of miles are of relatively little importance.

Science has taught us there is no limit to the universe;

there is no beginning and no end to space; there is no limit to the number of the stars. Where the most perfect telescopes can detect nothing, the photographic plate shows millions of stars whose obscurity is due to distance, not to insignificant size or lack of brilliancy.

About 100,000,000 stars are visible through the best telescopes, but there is evidence that these are only the preface to what lies beyond. Light travels at the rate of about 12,000,000 miles a minute, and the distance which it travels in a year is called a "light year." This light year is taken as the unit of measurement among the stars. We can have no conception of what this distance is: its vastness is past finding out by us, but it is simply a step as God measures distance. The light year is about 63,000 times the distance of the earth from the sun.¹

It seems probable that the star nearest to us is Alpha Centauri. It is 275,000 times as far from us as our sun, and it takes light from it about four years to reach us. There are not many stars within seven times as near us as this—probably not more than 500. Very few of the stars are nearer than 7,000 times the distance of Alpha Centauri, and light from the nearest of them has taken 10,000 years to reach us.²

The stars, other than the planets, are called fixed stars, not because they do not move, but because they do not seem to us to move, on account of their great distance from us. In point of fact, many of these stars are moving through space in straight lines, and perhaps no two of them in the same direction, with a velocity of at least 140 miles a second. We cannot comprehend such rapid motion any more than we can comprehend the distances of these stars from us, and their size is equally incomprehensible to the human mind.

Sir William Herschel concluded that he found some stars so distant that their light would require one thousand

¹ *Lessons in Astronomy*, Charles A. Young, pp. 295, 306.

² *Astronomy for Everybody*, Simon Newcomb, pp. 323-324.

years to reach us,³ and others 120,000 years, and still others so distant that their light would require 350,000 years to reach the earth traveling at the rate of 12,000,000 miles a minute.

A photograph may be made of a spectrum from the light of a star so distant that it has taken centuries for that light to reach us; but after so long a flight this light still retains all its original qualities, so that the chemical composition of the bodies from which it emanated may be accurately determined by the spectrum which it furnishes.

The light which we get from the stars is sufficient to be of some service, though its entire combined power is not great. It has been estimated that on a clear night the light received from the stars is about $1/33,000,000$ of that which we receive from the sun.⁴ Much of this light comes from the millions of stars that are invisible to the unaided eye.

The heavens contain many non-luminous stars, perhaps as many as there are of those that shine, and some of these are of great magnitude. Because of their non-luminosity they are ordinarily invisible, but occasionally they pass across the face of a luminous star, which they temporarily eclipse, confirming their presence. Certain peculiarities in the movements of some stars indicate the presence of an immense body which is invisible.

The time will come when our sun will no longer give forth light or heat, but will be moving through space as a dark, frozen body; no longer visible, as a star of the sixth magnitude, to the inhabitants of the planets, revolving about the suns which we now behold as little stars. This condition is certainly far in the future, but God has written in His book that it will surely come to pass.

Temporary stars of great brilliancy have from time to

³ *The Planetary and Stellar Worlds*, O. M. Mitchell, pp. 216-220.

⁴ *Lessons in Astronomy*, Charles A. Young, p. 309.

time appeared in the heavens, the exact nature and causes of which have not been clearly explained. Some of them have disappeared entirely, and others have gradually faded until they may be detected only by the best telescopes. Again, stars that were apparently as permanent as any have disappeared, leaving no trace. Have they moved so far away as to be no longer within reach of our instruments, or have they cooled off 'til they are no longer luminous? No one can tell.

Perhaps there is nothing in the heavens of more interest than the variable stars of which there are several varieties and great numbers, perhaps millions: new ones are constantly being found.⁵ These variable stars are subject to a great variety of changes; some of them simply change from stars of perhaps the first or second magnitude to the sixth or seventh magnitude during a period of years, and subsequently increase in brightness to their former brilliancy. Some of these stars have assumed the characteristics of nebulae, after a few months, perhaps indicating that a great collision has taken place and that the entire mass has been converted into gas and mist as the result of the great heat developed by the force of the collision of the two great bodies.

One of these nebulae is at a distance from us of more than 100 light years, which, expressed in miles, would be 598,500,000,000. It is even probable that this star or nebula is three times this distance away. It was first seen as a bright star on February 21, 1901, which would indicate that at a time, which we cannot with perfect accuracy determine, probably somewhere between February 21, 1601, and February 21, 1801, two dark suns of great magnitude and density and moving with terrific velocity collided, producing by that collision so much heat that the entire mass of both bodies was converted into fire, mist and gas. What better proof could we find than this of the first step in the nebular hypothesis? A large number

⁵ *Lessons in Astronomy*, Charles A. Young, pp. 311-320.

of variable stars have a period of about a year, remaining faint most of the time, rapidly increasing in brightness up to the second or third magnitude, and then after a few days quickly fading to their usual dimness.

Other variable stars are constantly changing in brilliancy during periods of three or four hours, and, after remaining at the same degree of brightness for a few minutes, change back to the other extreme of luminosity. Some of these variable stars change with such absolute regularity that their times can be computed to the second, and only a few days are required to complete the cycle.

Probably the same explanation would not apply to all the variable stars, and of none of these explanations are scientists entirely sure; still, reasonable theories, which are probably true, are not hard to find. These bodies are surely rotating on their axes, and no two of them rotate in exactly the same time; they may have dark spots and bright spots on their surfaces, and as they rotate these spots are alternately shown to us, which would certainly account for the behavior of many of them.

We know that the heavens are full of double, triple and quadruple stars which revolve about each other, or, sometimes, about a common centre; and these members of the compound stars often differ greatly in luminosity. So it is very easy to understand how the most brilliant of a group might be periodically eclipsed by one of the darkest members. Again, these distant suns may, and probably often do, have immense planets revolving about them in immense and eccentric orbits, and these planets may singly or in conjunction eclipse their sun in what appears to us at very irregular periods. It certainly would be strange if our sun were the only one among the millions which had the honor to be attended by a habitable planet.

Different opinions have prevailed as to the proper motions of the suns, and it used to be said that all the stars of the universe were revolving about Alcyone, one of the stars in the Pleiades, and that Heaven was undoubtedly

located in this star, and there would be found the throne of God. God's throne is in the heavens, but where no man knows. All the stars do not revolve about Alcyone, but seem to be moving in straight lines and in every direction with great swiftness. Arcturus is moving about 200 miles a second or 17,280,000 miles a day, and others equally fast.

There are many systems of triple and quadruple suns: one in the constellation of the Harp, "the components of the first pair revolve about each other in 1,000 years; the second pair revolve about each other in 2,000 years, and one pair revolves about the other pair in about 1,000,000 years." ⁶ In another instance, two stars revolve about each other in 60 years, and about a third in 500 years, and with an irregularity that indicates the presence of a fourth dark body which has never yet been seen.⁷ There are thousands of these double stars which revolve about each other in periods ranging from 30 years to thousands of years. The brilliant star Sirius has a dark star accompanying it which is barely perceptible by the telescope because of its feeble light, but which in magnitude or volume is 2/5 of that of Sirius.

The Milky Way appears to the unaided eye composed principally of luminous mist or clouds, but is found by the aid of the telescope and the spectroscope to consist largely of stars, and the stars which seem so near together are near each other only in appearance, as they are usually separated by distances beyond computation. It is these great distances which make them appear so small.

Many of the star clusters look like nebulae, and even the telescope is sometimes unable to determine their nature, but the spectroscope tells infallibly the difference between a cluster of stars and a nebula, and, further, reveals the character or stage in its evolution to which a nebula has advanced. A spiral nebula has advanced be-

⁶ *The Planetary and Stellar Worlds*, O. M. Mitchell, p. 231.

⁷ *Lessons in Astronomy*, Charles A. Young, p. 334.

yond the purely gaseous stage and is beginning to assume a definite form. It has been found that in double stars ⁸ the smaller member has a tint higher in the spectrum than the larger member, probably indicating a difference in age, or that one member is evolving or cooling faster than the other.

The color of a star is indicative of its age. The red stars are those which have cooled off most, and are slowly approaching the stage where they will be non-luminous and invisible. The white stars are in their youth, and in æons to come will slowly change as they cool to violet, blue, green and yellow, to orange and red, and ultimately will become non-luminous and disappear from sight. But who will be there or here to note these changes? Surely no son of Adam will be on this planet, for it will long since have become uninhabitable and our sun will have ceased to shine, moving through space as one of those dark bodies which no one can see.

The various bodies moving through space, our sun, the planets and their satellites, the wandering meteors, the stars and nebulæ, are all proved to be composed of the same chemical elements. It is possible, though not proved, that some stars may contain chemical elements not known to us and not found on this planet, but, as far as research can extend, all the separate bodies in the universe are composed of the same materials, not always combined in the same proportions. In the intense heat of the sun and stars there are no chemical combinations, each element remaining separate and distinct: Arrhenius claims that the spectra of some red stars, far advanced in cooling, show chemical compounds.

The same laws of chemical affinities and reactions, the same laws of light, heat, gravitation and motion, obtain in all parts of God's creation, showing that the universe is indeed one.

The glory and majesty of God are in the heavens. The

⁸ *Lessons in Astronomy*, Charles A. Young, p. 326.

movements of the stars and planets mark off for Him the hours of His great days, and the slowly evolving nebulae mark off for Him His eternal years; "His everlasting thought moves on His undisturbed affairs." But these manifestations of His glory and majesty, wisdom and power are beyond and outside the observation and experience of most of us; we can know of them only from the testimony of wise men who have searched out the laws of God and have learned something of His ways.

CHAPTER V

In all ages and in all countries it has been the fashion to stone the prophets, and the men who read God's book and had the courage to announce to mankind the truths which it taught have quite generally done so at the peril of their lives. Giordana Bruno was burned at the stake because he dared to assert and believe that there might be other worlds than this which *might* be inhabited. To this day the mere mention of the names of Darwin, Tyndall and Huxley will cause many theologians to gnash their teeth, froth at the mouth and rend their garments, though few of them have ever read a book written by any of these wise and good men. Sir Isaac Newton was accused, when he announced his laws of attraction, of introducing theories which were subversive of both natural and revealed religion.

Some good people look with pity and contempt upon a man who reads and believes God's book, and pray for his soul, which they are sure will be damned, because he does not believe or accept as the word of God certain books written by men. While most of us cannot read much of God's book that is written in the heavens or under the oceans, there is much of it that is written all about us, which we may easily learn to read; there are "sermons in stones, books in the running brooks, and good in everything."

The study of the structure of the earth is a comparatively recent undertaking; but great things have been found out, and, as this study is pursued, we shall learn more and more of *how* God made this earth and *why*. "For my part, I look at the geological record as a history of the world, imperfectly kept, and written in a changing dialect. Of this history we possess the last volume alone,

relating only to two or three countries. Of this volume only here and there a short chapter has been preserved, and of each page only here and there a few lines. Each word of the slowly changing language, more or less different in the successive chapters, may represent the forms of life which are entombed in our consecutive formations, and which falsely appear to have been abruptly introduced.”¹

In this record we learn that there has been an orderly continuity of evolution from the primeval chaos to the present more or less perfect and beneficent processes of nature. We see that everything has been developed for the good of mankind, and that mankind is slowly progressing toward a condition of perfection. We are justified in assuming that God made this world for man, and probably no higher order of intelligences will permanently inhabit it. Let us see how God made it.

Hundreds of millions of years ago the mass of which our earth and moon are composed was thrown off from our sun because of the sun's centrifugal force due to rapid rotation. This mass was a boiling liquid, gas and vapor, as hot as our sun is at present, full of exploding gases and constantly emitting great tongues of flame. Its diameter was approximately 500,000 miles, and it rotated on its axis in about 28 days, or perhaps it took a longer time. In the course of millions (perhaps hundreds of millions) of years, during which time it was emitting immense volumes of heat, it contracted and cooled until it became a plastic mass. Then, partly as the result of the centrifugal force developed by its increasingly rapid rotation, and partly as the result of an internal explosion, the moon was separated from its mother earth, about which it has continued to revolve in probably the same time that the earth was rotating on its axis at the time of the moon's birth.

¹ *Origin of Species*, Charles Darwin, p. 342.

On account of the advanced stage which it had reached in the cooling process, and on account of its comparatively small size, the moon rapidly cooled and did not greatly contract after it separated from the earth. As it has no atmosphere and no water or watery vapor, no changes have taken place on its surface since the volcanic action ceased, evidenced by the immense craters and lofty mountains of volcanic origin. As its crust cooled, it was warped and fissured and twisted, as well as deeply marked by immense volcanoes and lava streams. But these surface markings have remained unchanged, so that in this age we may look at the moon and see just how the earth looked before it had been smoothed and polished and scraped by ice and water, and the rocks disintegrated by the chemical action of oxygen and carbonic acid.

The abundant evidences of volcanic action all over the earth indicate that its surface conditions were once identical with those which we see on the moon today. (See Frontispiece.)

The crust of our earth has been warped and twisted in every conceivable way. Mountains, miles in height, were pushed up from the burning core below, and streams of lava thousands of feet thick had been poured over vast areas of the earth's surface before it cooled to the point where life in any form could exist. We can only guess at the condition and composition of the lowest rocks, as only about 10 or 20 miles of the earth's crust has been turned up so that we can inspect it. These lowest rocks are termed Plutonic or massive rocks.

Granite is one of the lowest and oldest of the rocks which we can inspect. It is composed of feldspar, mica, quartz and hornblende, which are silicates of lime, soda, potash or aluminum, and in which various other elements, as iron, are often mixed. These granites did not cool in the presence of air. They cooled and solidified slowly

Eras		Ages	Periods	Life	
Phychozoic		Age of Man	Recent	Man dominant	
Cenozoic		Quaternary	Pleistocene	Man	Climate Zones
		Mammals Tertiary	Pliocene Miocene Oligocene Eocene	Mammals dominant	
Mesozoic		Secondary	Cretaceous Jurassic Triassic	Reptiles dominant Birds and Mammals appear	
Palaeozoic		Carboniferous	Permian Coal Sub Carboniferous	Amphibians dominant	Appalachian Revolution
		Devonian		Fishes dominant	First Land Plants
		Upper Silurian			
		Lower Silurian			
		Cambrian			
Archaeozoic		Algonkian		Evidences of Life	Iron found
		Archaean		No Evidences of Life	

FIGURE X

under great pressure and at great depths and in great masses.²

Above these Plutonic or heat rocks we have the sedimentary rocks, made in old sea bottoms by the slow accumulations of sediment washed down from the land or accumulated from the bones or shells of fish or the decomposed products of corals or algæ. No accurate estimate of the age of the earth can be formed from the thickness of the sedimentary rocks, as these rocks have been subjected to denudation for untold ages, and new sedimentary rocks have been formed from the debris of the old rocks. Professor Huxley thought 100,000,000 years sufficient to account for all geologic changes, but Sir Charles Lyell estimated that 500,000,000 years had elapsed since the beginning of geologic history.

The sedimentary or stratified rocks are either sand rocks, clay rocks, or lime rocks. They are formed only at the bottom of water, and, as some portion of the crust of the earth was above water, the record will not be complete at all places. The lowest rocks are the oldest, but they may not be found now in their original position; they may have been thrown up and turned over on top of rocks of more recent formation.

The age of a rock is determined by its fossils, not by the character of the rock or its position; but rocks deposited at different depths and in different waters, as deep sea, lake or delta, will differ in fossils and composition, though of the same age. (Fig. X, opp. p. 72.) The accompanying plates, copied and altered from LeConte "show a section of the earth's crust, and illustrate geologic time and the progress of life."

Algonkian rocks alone, in the Lake Superior region, are 65,000 feet thick and the Archæan rocks are 50,000 feet thick.³ Volcanic or eruptive rocks of great thickness and of wide extent form a considerable portion of the earth's crust.⁴ The lava fields of the Northwest in

² *Elements of Geology*, Joseph LeConte, p. 214.

³ and ⁴ *Elements of Geology*, Joseph LeConte.

California, Nevada, Oregon, Washington, Idaho, Montana and British Columbia cover 150,000 to 200,000 square miles, and are from 3,000 to 7,000 feet thick.

These lava flows are often forced in between the layers of other rocks of an entirely different geologic formation, and, as a result, the adjacent rock is greatly changed in character and appearance. It may be melted by the great heat, and numerous chemical changes are sure to occur in it, and it will cool into an entirely different kind of rock from the original. This changed rock is called metamorphic rock. This metamorphosis in rock is produced by the action of water, heat and pressure in varying proportions; also by chemical action. True marble is a metamorphic limestone. In the precambrian (Fig. X, opp. p. 72) formations there is found limestone 94,000 feet thick and 60,000,000 years old.⁵

The earth's crust is forming now wherever sedimentation is taking place under water, and we are assured that chalk, which is pure carbonate of lime, is being deposited in the deep seas from the decomposing shells of Rizopods, Crinoids, Mollusks, Snails, Foraminifera, etc. These chalk formations in England and France are 1,000 feet thick and even thicker in other places.

The decomposition of feldspar, which is the cementing substance in granite, is the source of our clays and the kaolin which is used in the manufacture of fine pottery.

It should be remembered that there was originally no soil on the face of the earth, nothing but rock. Our soils have been developed by the decomposition and grinding up of these rocks by the various processes of nature. The oxygen and carbonic acid gases of the air disintegrate the rocks, water dissolves portions of them and washes them away and deposits the sediment in the valleys or at the bottom of seas or lakes or swamps, where it is converted into sedimentary rock. Water, when it freezes, opens up the rocks, often splitting them wide apart, and

⁵ *The Origin and Evolution of Life*, Henry F. Osborne, p. 104.

exposing greater surfaces to the chemical action of the atmosphere. The chemical rays of the sun are also a powerful factor in disintegrating the rocks and converting them into soil. Lastly, bacteria and vegetation penetrate deeply into the rocks and aid in their decomposition and the production of soil, from which further vegetation may grow.⁶

Professor LeConte states that rocks 5 or 6 miles in thickness have been removed by erosion in many places, and that sculpturing of the mountains by the elements has removed much more than now remains.

Rocks have been eroded, worked over, washed down into the seas, deposited as sedimentary rocks on the sea bottoms, and again elevated into mountains, eroded and disintegrated and washed down again and again. Thus sea bottoms are pushed up and made into lofty mountains, carrying with them the evidences of their aquatic origin in the sea shells, corals and aquatic plants in fossil form; and lofty mountains are disintegrated and removed till the place which once knew them is a level plain. From 30,000,000 to 50,000,000 years is a moderate estimate of the time required to complete erosions which are evident on the western continent.

Between the Archæan and the Palæozoic formations is an immense interval of time, the geologic records of which are mostly lost. (Fig. X, opp. p. 72.)

We have abundant evidence that the relative position of sea and land surface is constantly changing, though at present perhaps not with that cataclysmic suddenness which characterized early geologic eras. There are places in Italy where the coastline has changed at least 20 feet within historic times.

There are points in Scandinavia and Chili and Patagonia where the old sea beaches are 600, 1,180, 2,075 and 1,300 feet above the present sea levels, conditions which are proved by the presence in old raised beaches of

⁶ *Elements of Geology*, Joseph LeConte, p. 286.

barnacles and sea shells, and evidences of aquatic plants.⁷

Greenland is slowly sinking. Can this be due to the fact that the crust of the earth is pliable or elastic, and is bending in as the result of the great weight of ice which overlies that country?

Mountains are sometimes made by the forcing up of immense masses of rock by the lateral and internal pressure produced by the cooling and contracting of the earth's crust. Masses of rock 40,000 feet in thickness have thus been forced up and folded over other strata of rock, so that the original relative position has been reversed. Sometimes lava has been forced over or between these different strata, and, by its heat and chemical action, has completely changed the appearance and character of the contiguous rocks. In the highlands of Scotland some strata are slid 10 miles over others, and in the Rocky Mountains the Cambrian formation is slid 7 miles over the Cretaceous formation. (Fig. X, opp. p. 72.) In Georgia the Cambrian is in contact with the Carboniferous.⁸ There are many instances of this sort. Where a large amount of sediment is being brought down to the sea coast by the great rivers of the earth, the coast is slowly sinking. This is the case at Manhattan Island and the New Jersey coast, at the mouths of the Mississippi and Amazon Rivers, and at numerous points along the eastern coast of North America.⁹

The history of this phenomenon shows that when the sediment has accumulated to the depth of 30,000 or 40,000 feet, the earth's crust has given way or yielded to the immense lateral and internal pressure, and has moved in the direction of least resistance, upwards, and a range of mountains has been formed.

A theory,¹⁰ which seems tenable, accounts for this se-

⁷ *Elements of Geology*, Joseph LeConte, p. 140.

⁸ *Elements of Geology*, Joseph LeConte, p. 267.

⁹ *Elements of Geology*, Joseph LeConte, p. 143.

¹⁰ *Elements of Geology*, Joseph LeConte, p. 274.

quence of events as follows: The immense weight of this 40,000 feet of sediment slowly bends in the earth's crust, subjecting it more and more to the intense heat of the earth's core, until the crust is partly melted and weakened to the point where it can no longer resist the lateral pressure. With this accumulated sediment come up also immense masses of the subjacent rock and great quantities of melted lava. Perhaps the lava does not burst through the rock and reach the surface, forming a volcano and flowing over the surrounding country in great lava fields, but simply cools and solidifies in the bowels of the mountain, of which it ultimately forms the core.

"The mountain ranges were once marginal sea bottoms,"¹¹ as in the case of the Alps, which were marginal sea bottoms in the Mesozoic era and early Tertiary ages. Where parallel mountain ranges are found, they were each of them once old, deep sea bottoms, those nearest the present seacoast being the youngest.

We must remember that the mountains which we see today are only the remnants of their former glory, as much more has been removed by erosion than remains. The Catskill Mountains are all that is left of an extended plateau 4,000 feet or more in height, and the Adirondacks are the remains of great elevations weathered to the present altitudes.¹²

It is probable that the earth's crust is now so thick and solid and strong that it will experience no more of these cataclysms which have turned continents into sea bottoms, and sea bottoms into fertile plains, and erected lofty mountains where before was a placid inland sea. Some of our mountains are still growing, some are entirely worn away, so that only the scientist can know of their former existence. Some are in the process of decay.

The Paleozoic era (Fig. X, opp. p. 72) terminated, or

¹¹ *Elements of Geology*, Joseph LeConte, p. 272.

¹² *Elements of Geology*, Joseph LeConte, p. 261.

at least its termination was marked by the great Appalachian revolution: when the Appalachian system of mountains rose from the sea and a continent was born which connected South America, Africa, Australia and India and the Antarctic continent.¹³

The geologic record at this point is very incomplete, and for a long period, perhaps millions of years, we are unable to tell what God was doing to prepare the earth for the habitation of man. At this time the sea lines or coasts were greatly changed on both the Atlantic and the Pacific sides of the western hemisphere, and the great internal Cretaceous sea was formed, which practically filled what we now call the basins of the Mississippi River and its tributaries.

In the same way, the Rocky Mountain revolution marked the end of the Mesozoic era (Fig. X, opp. p. 72), and the interior Cretaceous sea ceased to exist, as its bottom was elevated and became the great interior plain of the United States, and the great Rocky Mountain chain rose from the sea.

Among the many peculiar conditions found in rocks is slaty cleavage, where the rock can be easily split along parallel lines. This is undoubtedly due to great pressure at right angles to the plane of cleavage, and where this rock is found near the surface it indicates that the great mountains that compressed it have been eroded and washed away.

We see that while the rocks and the mountains are being worn away and are disappearing in some places, in other places they are being made, and are slowly growing into the same immense thicknesses which were produced in former geologic ages.

According to Professor LeConte,¹⁴ sea bottoms are filling up at the rate of about 4 inches in 5,000 years, and the deep Atlantic has been making chalk at this rate ever

¹³ *Elements of Geology*, Joseph LeConte, p. 427.

¹⁴ *Elements of Geology*, Joseph LeConte, p. 74.

since the Cretaceous period. This chalky bottom is continuous with the chalk of Europe. At this rate, it will take a long time to fill up the oceans, which are at some places 12,000 to 18,500 feet in depth.

There is an undoubtedly close relationship between volcanoes and earthquakes, though either may exist independently of the other, and the exact causes of each are not always so apparent that scientists are in complete agreement.

Volcanoes are undoubtedly vent holes through which escape the gases, steam and melted matters from an internal furnace whose heat is more than $8,000^{\circ}$, sufficient to fuse all substances. Some scientists have thought that volcanoes had their source in the actual core of the earth, which, if it is not in a state of fluidity, under the incalculable pressure to which it is subjected and which holds it in place, immediately becomes a fluid or a gas when that pressure is removed. Immense quantities of deadly explosive gases are emitted by volcanoes in action, such as hydrogen, sulphurated hydrogen, carbon dioxide and innumerable compound explosive gases, the exact nature of which is not known.

Electricity in amounts beyond estimation is developed by the chemical and mechanical action of such tremendous forces, and, as a result, lightning and thunder, such as are experienced nowhere else on earth, are reported by those who have witnessed these displays of Nature's methods.

Immense quantities of water and steam also result from these eruptions, so much that it has been claimed that immense fissures in the bottom of the oceans must allow great quantities of sea water to flow into the internal furnace, which, being converted into superheated steam, was a principal cause of the volcanic explosion. This theory may be correct, but there seem to be some strong objections to it, and it appears more likely that this immense volume of water is formed anew from the hydrogen

and oxygen which form such a considerable proportion of the escaping gases.

We know that in the intense heat of the sun there are no chemical compounds, and we may be sure that the internal heat of the earth is sufficient to prevent a marriage between the hydrogen and oxygen which unite to form water as soon as they escape to our outer air.

May we not see, in a kettle of boiling porridge on any kitchen range, a demonstration of the volcanic history of the earth? When the porridge is boiling violently we see constant eruptions on its surface of steam and the heated mass which mount up to various heights. As the porridge cools, the eruptions become less frequent and less explosive until they finally cease. So, when this earth was a boiling, fluid mass, explosions were constant all over its surface, but now it has cooled till we only occasionally see a bubble rise to the surface, and we call this bubble a volcanic eruption. By and by they will cease entirely.

Other theories of volcanic action have been advanced, and it has been thought by some that volcanoes were entirely surface phenomena, not connected with the "internal core below," but simply eruptive pimples upon the face of mother earth.

As the earth cools it must of necessity contract, and as a result immense fissures or cracks occur in its crust, and these cracks enable one side to slip over and often on top of the other; sometimes one side is pushed up many feet. These slips are accompanied by a more or less violent agitation of the earth's crust, which is a second form of earthquake, and the form of most frequent occurrence during historic times. This latter form of earthquake is a daily happening. The tremendous internal and external explosions which precede and accompany volcanic eruptions often cause a great trembling and upheaval of the crust of the earth, which is one kind of earthquake. The lavas which are thrown out by these

different convulsions of the earth are true glass mixtures, or multiple silicates.

Before the crust had formed about the cooling earth it can hardly be said that an atmosphere existed, though various gases were being constantly emitted from its surface. But when a crust had finally encircled the globe to the extent that it was a fairly permanent covering, the gases that composed its atmosphere were ammonia, fluorides, chlorides, sulphur, hydrogen, sulphurous acid, carbon monoxide and carbon dioxide, nitrogen, and, comparatively early in the process, vapor of water. Of course, no animal or vegetable life could exist in such an atmosphere.

It is probable that all the oxygen of our atmosphere was supplied by the decomposition of carbon monoxide and carbon dioxide, and it is certain that these gases were emitted from the cooling earth and were thrown out in great quantities by the innumerable volcanoes.¹⁵

The carbon was removed from the atmosphere to some extent by the formation of limestone (carbonate of lime), but much more was removed by the vegetation, which was luxuriant for millions of years, and which, during the Carboniferous age (Fig. X, opp. p. 72) reached a profusion which we can hardly imagine. This vegetation was tropical all over the earth, equally luxuriant at the poles and at the equator, for a thick blanket of carbonic acid gas and aqueous vapor kept a uniform climate and unvarying temperature on all parts of the earth's surface. It is probable that the blanket of carbon dioxide and watery vapor kept the temperature of the atmosphere unvarying for hundreds of millions of years,¹⁶ and certainly during the Carboniferous age the climate was warm, stagnant, humid, uniform, and the vegetation universally tropical.¹⁷

Of course, the more land there was above the surface

¹⁵ *The Destinies of the Stars*, Arrhenius, pp. 168-169-170-171.

¹⁶ *The Destinies of the Stars*, Arrhenius, p. 175.

¹⁷ *Elements of Geology*, Joseph LeConte, p. 396.

of the seas, the more vegetation there would be, and, consequently, the more rapidly carbon would be extracted from the atmosphere.

It was necessary that this luxuriant vegetation should flourish for a long period of years in order that the immense coal deposits could be formed for the use of civilized man, and that the petroleum and natural gas formations which are proving of such inestimable value to man, might be accumulated. While it seems probable that all these hydrocarbons, which we designate as crude oil, rock oil, or petroleum, were formed from coal by some sort of metamorphosis or distillation which we do not entirely understand; they may have been formed in the bowels of the earth by chemical processes and pressures which are equally beyond our ken.

We have seen that probably for hundreds of millions of years a blanket of carbon dioxide and watery vapor kept the temperature of the earth uniformly tropical over its entire surface, but that vegetation gradually absorbed the carbon, leaving the oxygen free in the atmosphere. By an entirely different process the atmosphere was freed of a large portion of its aqueous vapor. When the orbit of the earth was at its most elliptical form, the earth would be so far from the sun when it was in aphelion that the intense cold would precipitate most of the moisture, either in the form of snow or ice or water, and then, for the first time in the history of our planet since a crust formed about it, the sun would shine.

It is probable that there were no climate zones until the Eocene period, the climate being uniform over all the earth.¹⁸ The protection afforded from frost by a blanket of watery vapor is often noticeable in our time in the temperate zones during Spring or Fall. If the night is cloudy or foggy, no damage will be done vegetation, but if, the temperature being the same, it be clear and the stars are shining, serious havoc may be wrought by a killing frost.

¹⁸ *Elements of Geology*, Joseph LeConte, p. 513.

CHAPTER VI

The preparation of the earth's surface for the habitation of man was a process requiring untold millions of years for its completion. Not only had the great mass to cool on its surface until a crust would form, but on this solid crust of Plutonic rock of unknown thickness, sedimentary rocks many miles in thickness had to be deposited in sea bottoms, often at the slow rate of 5 inches in 6,000 years. Then eruptive volcanic rock was often poured out over the earth's crust many thousands of feet thick, and, as a result of heat and pressure, metamorphosis of rock took place in many places, and all kinds of rock were piled up and turned over and twisted in every conceivable state of confusion. These rocks then had to be polished, ground down and disintegrated, and a soil prepared for the growth of vegetation. After millions of years of unexampled luxuriance this vegetation was buried deep till it was slowly converted into coal and petroleum and gas for the use of mankind.

In all these processes of preparation, water was perhaps the most important factor; first as fog or vapor, then as fluid, and last as ice. The vapor, by its constant supply of moisture, favored that abundance of vegetation which made the coal seams possible, while the fluid water dissolved the rocks and washed down into the valleys and sea bottoms the soil which made vegetation possible and the sediments which formed a portion of the sedimentary rocks.

How much was done by the action of ice we, perhaps, cannot certainly state, but we know that ice was a potent factor in grinding down the mountains and pulverizing the rock meal, which is a large constituent of the soils of the earth.

At the present time the accumulation of ice about the South Pole and at many places within the Antarctic circle is probably 6 miles in thickness, and covers an area of from 4,000,000 to 8,000,000 square miles. This ice cap melts appreciably during the Antarctic summer, but not more than 20 to 30 feet are removed in this way each season, while more than that accumulates each winter.

At the present time Greenland is covered with an ice sheet from 3,000 feet to 6,000 feet in thickness, and this mass is moving toward the sea in every direction from its center. The Antarctic ice moves steadily from the Pole to the seas, irrespective of the configuration of the country. And from this continental mass icebergs nearly 2 miles in thickness and 3 miles in length have broken off, and have been found by navigators floating in the open ocean.¹

These icebergs are so large that they have been mistaken for islands by more than one navigator. As these icebergs float only from 1-7 to 1-12 above water, this mistake might easily be made.

There is abundant evidence that in the northern hemisphere the ice has been equally thick and has covered an equally extensive area, and these ice ages have repeatedly occurred, alternating between the northern and southern hemispheres. Some of the ice ages have been longer and more extensive and more severe than others. How many of them have occurred it is impossible to tell, but probably more than scientists have generally supposed. During the last glacial period in the northern hemisphere the ice between the St. Lawrence River and Hudson Bay was 12,000 feet thick, and the ice over the States of New York, Massachusetts, Vermont and New Hampshire was 5,000 feet and up to perhaps twice that thickness.² This ice moved slowly toward the south, grinding up the rock

¹ *The Ice Age in North America*, Wright. Floating Ice Picture, p. 107.

² *The Ice Age in North America*, Wright, p. 164.

beneath it and transporting portions hundreds of miles. It moved toward the south because the immense and accumulating pressure at the north forced it to move in the direction of least resistance, which was toward the warmer zones; and the centrifugal force developed by the rotation of the earth on its axis would have a tendency to force the ice toward the equator.

Long Island and Block Island are portions of the terminal moraine of this great continental glacier. On Block Island may be seen large masses of granite which were torn off from the granite ledges of New Hampshire and transported to their present location by ice sheets thousands of feet in thickness.

In various parts of New England and New York State boulders of great size, weighing 10,000 tons or more, have been transported across deep valleys, and are now found hundreds of feet above sea level, whose origin in the ledges of rock far to the north can be determined by their composition.³

In going east by train from Albany on the Boston and Albany Railroad, the traveler will notice the white marble boulders in the cuts made for the railroad and over the fields. These marble boulders were broken off by the ice from the marble ledges of Vermont, many miles to the north, and transported in and under the ice to their present resting places. Moreover, they were smoothed and polished and often grooved and scratched by the ice, and by the action of the water produced by the melting ice.

As he goes farther east along the same line of travel, the observer will notice that there are no more marble boulders, but that the boulders are of granite, which have been brought down by the ice from the granite ledges of New Hampshire. These large and hard pieces of rock, as they have been borne along under the weight of 5,000 feet

³ *The Ice Age in North America*, Wright, pp. 206-207-208-209-210.

of ice, have acted as immense cutting tools, and we find deep grooves in the rock, extending mostly from north to south. John Burroughs reports finding them near his home on the Hudson; they may be found in various parts of eastern New York and New England, and on the exposed rock in Bronx Park in New York City are some very beautiful and characteristic markings made by this great graving tool.

These enormous ice caps have not been present at the same time around both Poles of the earth, but have alternated about once in 21,000 years. At the present time the northern hemisphere is having its winter while the earth is in perihelion, that is, when it is nearest the sun; consequently, we are having mild and short winters and long summers, while the southern hemisphere is having long and severe winters and short summers, because its winters occur while the earth is farthest from the sun, and its summers while the earth is at perihelion or nearest the sun.

There is good and abundant scientific authority⁴ for the belief that the ice cap in the northern hemisphere has been heavy enough at times to change the center of gravity of the earth, so that the North Pole would point to a lower place in the heavens than at present, and the plane of the earth's equator would make a greater angle with the plane of the ecliptic than at present. This *might* cause the waters of the ocean to flow over the land and account for the submergence to the depth of 1,000 or 2,000 feet of large portions of the northern hemisphere. When the southern hemisphere developed its ice cap and that on the northern hemisphere melted, the earth *might*, and probably would, tip the other way, the North Pole up and the South Pole down; then the submerged land of the North would rise from the sea, and large land areas in the southern hemisphere would disappear. This *may*, and probably does, account for the oscillation of sea levels

⁴ Croll, *Climate and Time*, p. 389.

and the apparent elevation and depression of land surfaces.

This may be, and probably is, the explanation of the fact that more than once in geologic times the North Sea has been dry, England and Ireland have been connected by dry land, and England united to the continent. This would give an opportunity for tropical animals to migrate to the British Isles, as we have positive evidence that at some periods they have done.

"Mr. Croll believes that the last great glacial period occurred 240,000 years ago, and lasted 160,000 years."⁵ With respect to more ancient glacial periods, probably such occurred during the Miocene and Eocene formations, not to mention more ancient formations. Mr. Croll believes that whenever the northern hemisphere passes through a cold period, the temperature of the southern hemisphere is raised. This conclusion throws so much light on geological questions that I am strongly inclined to trust in it." Mr. Croll has estimated⁶ that a diminution of 470 feet in the thickness of the Antarctic ice would raise the level of the sea at the latitude of Glasgow 25 feet. Now, as ice will barely move on a slope of 1° , it would appear that the ice at the South Pole might probably be 24 miles thick. If 2 miles of the thickness of ice at the South Pole were melted, and a similar thickness accumulated at the North Pole, it would so change the centre of gravity of the earth that the sea would rise 312 feet at the latitude of Edinburgh.

Just prior to and during the early part of the last ice age, the surface of the land in North America was from 1,000 to 2,000 feet above its present level. What caused the sea to rise or the land to sink? Was it because the weight of ice within and south of the Arctic circle had tipped the North Pole down and changed the centre of gravity of the earth, or was the crust of the earth still

⁵ *Origin of Species*, Charles Darwin, p. 397.

⁶ *Prehistoric Times*, Sir John Lubbock, p. 427.

elastic, so that it was depressed by the weight of ice? This latter is or was the opinion of Warren Upham. Whatever the causes, we find sea beaches on the eastern margins of North America from 75 feet to 1,000 feet above present sea levels, and this condition has been found in almost all parts of the earth.

Probably all parts of the earth have been subjected to glaciation at some time in its history.

Holland, in his Presidential address before the British Association in 1914,⁷ assumed that during the Algonkian age (Fig. X, opp. p. 72), an ice or glacial period existed which covered the entire globe. There are evidences of extensive glaciation in New Zealand and Australia, and North America, at the last ice age, was covered down to the latitude of New York City, and thence across the continent; Europe, at different times, has been thoroughly scraped by ice. Of course, each ice age pretty nearly obliterates the evidences of previous glaciation.

There are undeniable evidences of glaciation in all the ages of the earth from the Algonkian up; in Cambrian, Silurian, Sub-carboniferous, Carboniferous, Permian, Cretaceous, Miocene, Pliocene and Eocene ages. (Fig. X, opp. p. 72.) The last *great* ice age in the northern hemisphere probably commenced 240,000 years ago and lasted 160,000 years, terminating about 80,000 years ago.

Of course, this age of ice, refrigeration and death does not come on in a decade nor in a century. It creeps on slowly from one century to another, gradually driving before it towards the equator all forms of life, and obliterating every feature of the landscape. It goes over the tops of the mountains, and the valleys are filled up to one universal level.

What has happened so many times before will occur again. "The mills of God grind slowly, and they grind exceedingly small," but they are sure to grind, and the time will come, perhaps 150,000 years from this century,

⁷ *The Destiny of the Stars*, Arrhenius, p. 174.

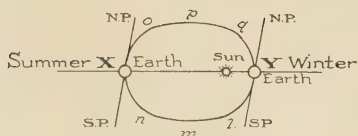


FIGURE A

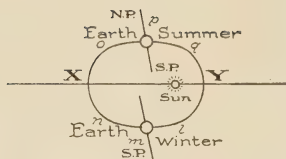


FIGURE F

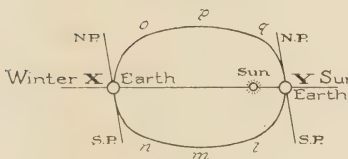


FIGURE C

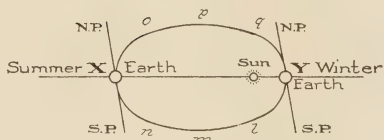


FIGURE B

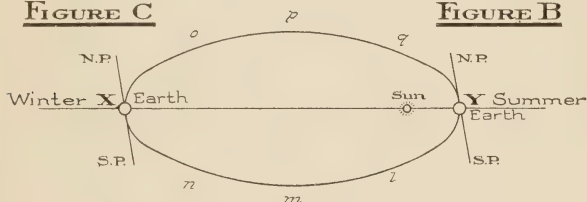


FIGURE E

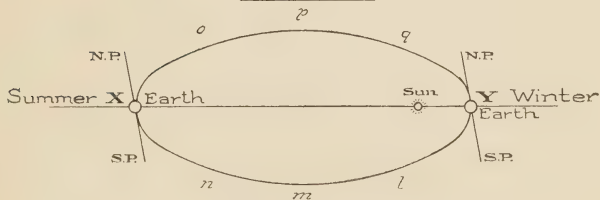


FIGURE D

PLATE W

when all the monuments and evidences of civilization in Europe and America will be covered miles deep with ice, grinding them to powder. Then surely Macaulay's *Antiquarian* from New Zealand will find no London Bridge on which to stand and no ruins of St. Paul to sketch; the traveler from distant regions will find no mouldering pedestal upon which to decipher the name of England's proudest statesman, and there will be no ruined dome of England's proudest temple above which savage hymns may be chanted. The civilizations of the north will be driven from their present moorings to seek habitable places south of the equator. When this ice age shall have passed away there will certainly be a new earth, and perhaps the evolution of man's spiritual and moral natures will by that time have brought about a new Heaven upon earth.

The cause of the ice ages has been one of the puzzles of science and still remains one of the discussed problems. Sir Charles Lyell thought it might be explained by the distribution of land and water, and that the various elevations and depressions of land surfaces were the causes of the ice accumulations. It seems probable that Sir Charles mistook the effect for the cause. While these phenomena undoubtedly had much to do with temperature, it can hardly be thought that they were the only or principal cause of the immense glaciations of the northern hemisphere, especially as equal glaciations are now occurring in the Antarctic regions. There is no doubt but that luxuriant and tropical vegetation has prevailed over long periods up to the Poles, and conversely an Arctic climate has prevailed down into low latitudes.

According to Croll, the temperature of interstellar space is 239°F. below zero, and that would be the temperature of the surface of the earth if there were no sun. So it has been suggested that perhaps the earth passes through colder parts of space at times, which might account for ice accumulations on its surface. Someone has suggested

that the sun may be a variable star, and that many times more heat may have been emitted from its surface at some periods than at others. But the records of the glaciations show that they were not dependent upon any such chance occurrences, but on the orderly processes of nature.

Every detail of the ice ages can be explained by the changes in the shape of the earth's orbit. The orbit of the earth, or the path which it follows in its yearly journey around the sun, is not a circle, but an ellipse, with the sun at one of its foci. The shape of this ellipse is constantly changing. At present it is approaching the shape of the circle as seen in A (Plate W, opp. p. 88), with the earth at perihelion or at the end nearest the sun in the winter of the northern hemisphere. It traverses the line l, m, n, o, p, q, summer occurring when the earth is at the long end of the ellipse, or aphelion. At present the sun is 3,000,000 miles nearer the earth in winter than in summer, consequently, we are having comparatively short, mild winters and long summers. But the earth not only revolves about the sun in the path l, m, n, o, p, q, once a year, but, as a result of the phenomenon called by astronomers the precession of the equinoxes, the seasons also slowly move around with the earth in the same path, making the complete circuit of the ellipse in about 21,000 years. In Figure F it will be noted that winter of the northern hemisphere has gotten about half-way around to X. When winter gets around to X (Fig. C, opp. p. 88), then the earth is having its Arctic winter while it is at the long end of the ellipse.

It will be noticed that in Figures B and C the orbit of the earth is more elliptical than in A and F, and it takes the seasons about 21,000 years to make this circuit. When the Arctic winter is occurring at X (Fig. C, opp. p. 88) there will be great accumulations of ice in the northern regions, which probably would be about 5,000 years in accumulating and 5,000 years in melting.

But the alternations of winter from perihelion to aphel-

ion during a cycle of 21,000 years does not explain all the variations of climate which are produced by the varying amounts of the eccentricity of the earth's orbit. The winter solstice was in aphelion 11,700 years ago; 33,300 years ago, and 61,300 years ago.⁸

In addition to the conditions brought about when the orbit of the earth is as represented in A, B, C and F, we have at long intervals a condition which may be represented by D and E. In these Figures the earth's orbit is represented as it exists when it has reached its greatest eccentricity. In Figure E it will be noted that the Arctic winter occurs in aphelion, at which time the earth is 14,000,000 miles farther from the sun than it is when it is at the short end of the ellipse, and the Arctic winters are forty-four days longer than the summers, as may be surmised when it is noticed how far the earth has to travel around this long end of the ellipse. It is easy to see that, both on account of the prolonged winter and on account of the greater distance from the sun, the conditions would be ideal for the production of great masses of ice.⁹

The periods of greatest eccentricity of the earth's orbit have occurred at long intervals through a remote past. The following dates are given by Croll: ¹⁰ 100,000 years ago; 200,000; 750,000; 850,000; 950,000; 1,150,000; 1,250,000; 1,500,000; 1,850,000; 1,950,000; 2,500,000; 2,600,000 years ago. These dates undoubtedly represent the time of maximum accumulations of ice, with numerous variations of heat and cold, advances and recessions of the ice sheet.

The periods in the future when the orbit of the earth will reach these extremes of eccentricity are given by Mr. Croll as 150,000 years hence; 400,000; 500,000; 600,000; 800,000; 900,000; 1,000,000 years hence. With winter occurring in aphelion at these times of great eccentricity,

⁸ *Climate and Time*, Croll, p. 409.

⁹ *Climate and Time*, Croll, p. 313.

¹⁰ *The Ice Age in North America*, Wright, pp. 416-419.

there is every reason to suppose that ice ages, as severe as any in the past, would be the result.

With the conditions as in Figure D, with winter occurring in perihelion, the earth would be 14,212,700 miles nearer the sun in winter than in summer. This would almost entirely obliterate the difference between winter and summer, and summer would be longer than winter by forty-four days.¹¹

The evidences of the ice ages are numerous in New England and New York state, and may be seen along almost any country road. Drumlins, which are sub-glacial ground moraines, extending in the direction of the ice movements, are frequently detected. Small local terminal moraines are often found at the termination of valleys, marking the recession of the ice at that point. Kettle holes may frequently be seen, marking the places where masses of ice were melted which had first been covered by glacial debris.¹² Many drumlins have also been found in Ireland.¹³

The Finger Lakes of central New York, and the innumerable lakes all over New England and New York state are basins scooped out by the ice, whose outlets have been dammed up by glacial debris or terminal moraines. These lakes are gradually filling up and draining out, and by and by will disappear. Their presence is indicative of comparatively new topography.

Since the last ice age numerous valleys have been cut out by the rivers, and deep gorges have been cut through the rocks. The most noted of these is the gorge below the Falls at Niagara, which has been cut back by the river from Lake Ontario since the ice of the last glaciation melted. An equally interesting, though not so grand, gorge has been cut through the rock by the Mohawk River at Cohoes, N. Y. Deep gorges, cut by compara-

¹¹ *Climate and Time*, Croll, p. 422.

¹² *The Ice Age in North America*, Wright, p. 130.

¹³ *The Ice Age in North America*, Wright, p. 258.

tively small streams through boulder clay, sand and gravel, are to be seen wherever the ice age deposited great amounts of glacial debris.

That a great river once emptied into the valley of the Hudson below Albany is evident. The range of low mountains extending southwest of Albany to west of Schenectady marks its southern bank. This old river bed was obliterated, or filled in by materials scraped off the north country by the ice, and the Mohawk River had to find a new outlet farther to the north, at Cohoes.

Lake Ontario, which used to empty through Oneida Lake and the valley of the Mohawk into the valley of the Hudson, found its old path to the sea filled up with glacial scrapings, and had to find a new outlet through the St. Lawrence River.

When land surfaces were much higher than at present, many rivers cut down their beds to the level of the ocean, and subsequent land depression has left many of these river beds below the level of the sea. Illustrations of these drowned rivers, as they are called, are the Hudson, Chesapeake, Delaware and St. Lawrence.

These and innumerable other processes of Nature were for the purpose of preparing the earth for the habitation of man and for his further development. When God had prepared everything for his reception, then man appeared and proceeded to work out his salvation according to the established laws of evolution.

While cool and habitable upon its surface, the internal fires of the earth are still burning, and at a depth of 2 miles we should find a temperature of about 212° F., which we may suppose continues to increase as we go deeper.

The rocks had to be disintegrated and worked over to make soil for vegetation, as no animal life could be supported without it, and for this purpose water, carbonic acid and oxygen are the three great agents. The action

of bacteria and vegetable mould are also important factors in soil formation.

The distribution of heat, all of which is derived from the sun, has been provided for, not only by the movements of currents of air, but also by the movement of great ocean currents. According to Croll,¹⁴ the Gulf Stream is 5 miles wide, 1,000 feet deep, moves at the rate of 4 miles an hour, and transports daily 66,908,160,000,000 cubic feet of water. At least half as much heat is conveyed by the Gulf Stream alone from the tropics to the Arctic as is received from the sun in those regions, and as a large part of the heat of the Gulf Stream is received from the southern hemisphere, this is an additional reason why extreme cold prevails there. It has even been asserted that $1/5$ of the heat of the North Atlantic is due to the Gulf Stream. The waters of the deep sea, returning from the Arctic regions to the Tropics, are nearly ice cold. In this way are temperatures modified, the north is warmed and the south is cooled.

Croll is responsible for the further statement¹⁵ that for 85 days, from May 10th to August 3rd, the heat received from the sun at the North Pole is greater than that received at the equator. It should further be remembered that zones of temperature are of comparatively recent origin, as they did not exist before the Eocene period. (Fig. X, opp. p. 72.)

Everywhere the soils are moving toward the sea, washed down by the rains and carried largely by the rivers. Croll and Geikie have estimated that the denudation amounts to 1 foot in 6,000 years or 1,000 feet in 6 million years, and it has been asserted by Mr. Alfred Taylor that the Mississippi basin is being lowered 1 foot in 10,000 years. In some parts of Asia there are deposits 2,000 feet thick which have been carried by the wind to their present position, and in many other parts of the earth

¹⁴ *Climate and Time*, Croll, p. 24.

¹⁵ *Climate and Time*, Croll, p. 65.

currents of air and winds are responsible for great accumulations of soil.

Buried river channels are found in numerous places in England and Scotland; the Fiords of Norway are drowned river valleys which often may be traced far out to sea.

The crust of this old earth is not stable yet; in some places it is rising and in some sinking. The Thousand Islands of the upper St. Lawrence have risen approximately 300 feet in post-glacial times, before which Lake Ontario was an arm of the sea. The eastern end of Lake Ontario is still rising. The old Iroquois beach, from Richland to Watertown, N. Y., has a pitch of 5 feet to the mile, and this tilting is still going on at the rate of 5 inches to 100 miles in a century.¹⁶ If this tipping, which also involves the territory of the upper Great Lakes, continues, it will result in throwing the waters of these lakes, through the Chicago River, into the Mississippi.

¹⁶ *Elements of Geology*, Joseph LeConte, p. 586.

CHAPTER VII

We hold to the opinion that this earth was designed for man. That the Creator, by the processes of nature, a few of which have been briefly described, has prepared the soil and the rocks, the treasures of iron and copper, gold and silver, coal and oil, which He has hidden beneath the soil and the rocks, so that all the material comforts needed by man may be easily supplied, and he may be left free to develop his intellectual, moral and spiritual natures, until a Heaven on earth has been attained. Toward this ideal perfection man is slowly moving. Men are in a hurry sometimes and cannot wait, but God is never hurried, and He can wait.

In some manner which science has never explained, organic life was introduced upon the earth. We have been taught these many centuries that it was a direct act of creation which brought each type or species of plant or animal life into existence, but this is not the way God's Book reads, and the men who taught this heresy never tried to peruse it. Many theories have been advanced to explain the advent of organic life, but none of them has been proven. "The more modern scientific opinion is that life arose from a recombination of forces pre-existing in the cosmos. To hold to this opinion that life does not represent the entrance of either a new form of energy, or of a new series of laws, but is simply another step in the general evolutionary process, is certainly consistent with the development of mechanics, physics and chemistry since the time of Newton, and of evolutionary thought since Buffon, Lamarck and Darwin."²

"Life probably originated on the continents, either in the moist crevices of the rocks or soils, in the fresh waters

² *The Origin and Evolution of Life*, Henry F. Osborne, p. 2.

of continental pools, or in the slightly saline waters of the primordial seas.”³

Richter, Kelvin and Arrhenius all have suggested that living germs *may* have reached the earth from the interstellar space through which the earth is moving at the rate of 1,000,000 miles a day, driven in by meteors or the pressure of light or gravitation. If we are given the living germ, the theories and demonstrations of Mr. Darwin will explain all the rest. “I believe that all animals are descended from at most only four or five progenitors, and plants from an equal or lesser number. Analogy would lead me one step further, namely, to the belief that all animals and plants are descended from some one prototype; but analogy may be a deceitful guide.”⁴

“Mr. Darwin’s hypothesis is not, so far as I am aware, inconsistent with any known biological fact; on the contrary, if admitted, the facts of development, of comparative anatomy, of geographical distribution and of paleontology become connected together, and exhibit a meaning such as they never possessed before; and I for one am fully convinced that that hypothesis is as near an approximation to the truth as, for example, the hypothesis of Copernicus was to the true theory of planetary motions.”⁵

The geological signs of plant life are coal and iron, and these signs are first manifested by the finding of iron in the Algonkian formations (Fig. X, opp. p. 72). These early specimens of vegetation were aquatic, as there were no land plants until the Devonian age, when forests prophetic of the luxuriant Carboniferous age were in evidence.

The vast quantities of carbonic acid in the atmosphere up to and perhaps through the Carboniferous age would

³ *The Origin and Evolution of Life*, Henry F. Osborne, p. 35.

⁴ *Origin of Species*, Charles Darwin, p. 500.

⁵ *Man’s Place in Nature*, Huxley, p. 149.

have been fatal to man, and to most of the animal life upon earth during historic times; so God had a plan to store up this carbon where it would keep and could do no harm, and where it would be ready for man's use when he was ready for it. Some of the carbon was stored up in limestone, chalk and marble, all of which are carbonate of lime; but probably much more in the luxuriant vegetation which went to make the coal measures, the *natural* gas and petroleum oils, without which modern civilization could not exist.

The Carboniferous strata (Fig. X, opp. p. 72) average about 3 miles in thickness, and the coal measures are from 4,000 to 15,000 feet in thickness. Coal was made somehow as follows: Immense quantities of vegetable matter accumulated as peat in swamps, over which were laid lake or river deposits. Subsidence of the land, caused perhaps or probably by an ice age, caused the sea to overflow it, and a deposit of limestone was laid over it. After thousands of years an upheaval converted this entire deposit into a mountain, or at least raised it well above the sea. This process was perhaps repeated many times, which accounts for the layers upon layers of coal and limestone and clay. The anthracite coal was produced by metamorphosis for the production of which heat and pressure are the principal factors. It has been the opinion of numerous scientists that a seam of coal a yard thick would accumulate in about 8,000 years, and that probably 1,000,000 years were required to make the coal deposits which are now known to exist.

According to Croll,⁶ the thickness of a coal seam depends upon the length of the interglacial period; sometimes it was 6,000 or 7,000 years, and at other times 16,000 years, largely because perihelion moves more rapidly at some times than at others. Sometimes there would be warm interglacial periods of perhaps 10,000 years, during which the coal-forming vegetation would be luxuriant;

⁶ *Climate and Time*, Croll, pp. 428 and 425.

this would be followed by a cold spell of perhaps 10,000 years, during which there would be glaciation and the coming in of the sea and deposits of limestone sediment. All this repeated numerous times explains our coal fields.

The exact nature of the vegetation of the Carboniferous age is revealed to us in the trunks, stumps, leaves, roots and fruits of the trees and ferns, and all the various plants are accurately preserved in the coal in almost perfect condition. The following groups are often found: gymnosperms, ferns, lepidodendrids, sigillarids and calamariæ.⁷

Animal life of a very low form must have been co-existent with the early aquatic plants, for vegetation is closely dependent upon bacteria for its nitrates, which are developed from nitrogen by bacteria.⁸ In these early ages, hundreds of millions of years before climate zones were evolved, it is doubtful if the beautiful green which we see all about us in the vegetable world was often present. The red, blue and violet rays of light which are absorbed by the leafy plant are the source of the energy which enables the plant to carry on its functions, while the green rays are reflected or transmitted, conveying to our eyes its color.⁹ But as there was no sunlight, as we know it, simply the diffused light of dense fogs and thick, heavy clouds, the green color of vegetation must have been very pale.

The two unmistakable signs of animal life which are recorded in God's Book, are limestone or marble, which is metamorphic limestone, and the presence of fossils. The limestone accumulated in sea bottoms by the slow deposit of the shells of crinoids, coquina, snails, foraminifera, mollusks and other shellfish, and the bones of fishes. This accumulation was slow; centuries were required for

⁷ *Elements of Geology*, Joseph LeConte, p. 372. Plates on pp. 372 to 387.

⁸ *The Origin and Evolution of Life*, Henry F. Osborne.

⁹ Harold Wagar.

the collection of a few inches, but the record left is of the greatest interest, and no intelligent person can dispute what it shows. God did not make this rock and put these shells into it in the places and at the levels where they are now found, as was defiantly asserted by a noted divine not many years ago. The making of these limestone rocks was not a part of six days' labor, from which the Creator rested on the seventh day. God has never rested; He is making limestone rock, and, so far as we can tell, all other kinds of rock every day.

The animals which have lived in all the periods of geologic history have left their bones imbedded in the rocks and soils and caves, and by a study of these bones it is possible to know the size and habits of these animals; upon what they fed; whether they were carnivorous or herbivorous, and, to a great extent, over how much territory they wandered.

The forms of life inhabiting the seas have had much to do in constructing the crust of the earth. It is supposed that limestone is always of organic origin, made out of the shells and bones of fishes and out of coral mud, which is being deposited at the present time, and has been deposited throughout all geologic history over wide areas. In this limestone corals are found in all stages of comminution. Corals absorb carbonate of lime from the sea water, and grow in the sea much as some forms of vegetation grow on the land.¹⁰

In Silurian ages (Fig. X, opp. p. 72) corals grew in all the seas all over the earth, indicating a great uniformity of temperature at that time, due to the blanket of carbonic acid gas and watery vapor which then enveloped the earth. Calcareous algæ are also of importance as reef builders in some localities.

Corals are building up islands over an area of about 20,000,000 square miles, while this area has been slowly sinking for hundreds of thousand of years. The sinking

¹⁰ *Elements of Geology*, Joseph LeConte, p. 152.

of the sea bottom goes on at practically the same rate as the corals build up their islands, for corals cannot live at a depth of more than 100 feet below the surface of the sea. These corals build up their islands at about the rate of 1 foot in a century, at which rate it would require from 500,000 to 1,000,000 years to build up many of the coral formations.

In the animal life of this world, as outlined in geologic history, we have revealed to us, perhaps more clearly than in any other way, the great law of evolution, which is fundamental in all God's operations. Man's life is so short, history is so brief, that the functioning of this great law was not suspected until science was able to look millions of years into the prehistoric past, and note the slow and sure development from one geologic period to another.

It is apparent that God was not only preparing the earth to be a suitable habitation for man, but that He was developing the animal kingdom, through millions of forms, up to the point where man could emerge from his lowly ancestry, and could develop an intellectual and moral and spiritual nature, prophetic types of which had been present in some of the more highly organized animals.

Progress never stops, evolution never stops, improvement never stops. As we read geologic history we learn that life in its simplest forms existed way down in the Algonkian (Fig. X, opp. p. 72) formations, and that in each geologic age more perfect and more complicated forms were always taking the places of those forms which had preceded them. One of the most astonishing facts which we continually observe as one geologic age succeeds another is the appearance of prophetic types in the animal kingdom; that is, in the anatomical structure, size and habits of an animal we find the developing organs and habits which evolve into a more perfect form in the succeeding age.

Way down in the Algonkian we find evidences of life. In the Cambrian age invertebrates of all classes appear.

In the lower Silurian age vertebrates in the form of fishes are found, prophetic of the innumerable species of back-boned animals which were to possess the world. In the upper Silurian the invertebrates were still the dominant class, with the vertebrated fishes increasing in importance. In the Devonian age we find the fishes the principal class, more perfectly developed, and types prophetic of the Amphibians which were to be the dominant class of living creatures in the late Carboniferous age. These Amphibians were the connecting link between the fishes and reptiles, of which latter class they were prophetic. Birds, which evolved from reptiles, first appeared in the Jurassic (Fig. X, opp. p. 72), at which period also appeared types prophetic of the mammal. These prophetic mammals were Marsupials, which incubated their young partly in a uterus and completed the later incubation in a sack containing the mammary glands. Reptiles were the dominant class clear up to the Eocene (Fig. X, opp. p. 72), when fully developed mammals became the ruling class of animals.

Somewhere along in the early Tertiary age appeared the ape or monkey, prophetic of prehistoric man, who probably appeared as a beast man in the Pliocene period. In the Pleistocene period (Fig. X, opp. p. 72), the evidences of the presence of man are unmistakable, but not until the Psychozoic era did he become the ruling animal of the world. Prehistoric man was little better than the beasts from which he had evolved.

In all these countless centuries of development we find that God never goes backward, never repeats Himself; if a type becomes extinct, it never reappears.¹¹ This fact certainly points to an age of human perfection on earth, for from the Algonkian age to the present time there has been an unvarying progress in the forms and development of animal life, first in the physical, then in the mental; in

¹¹ *Elements of Geology*, Joseph LeConte, p. 510.

recent centuries the moral and the spiritual values have slowly assumed their place as the dominant factors in the world. Geologic and human history show that God has never gone backwards: "His everlasting thought moves on."

"Rudimentary forms and organs, as found in fossils and living animals, are undoubtedly the result of disuse, and this condition is hereditary. Nature may be said to have taken pains to reveal her scheme of modification by means of rudimentary organs of embryological and homologous structures, but we are too blind to understand her meaning."¹² Foetal whales have teeth, though the adult has no teeth, and there are teeth in the upper jaw of unborn calves, which never cut through.

The geologic record, which is the only record we have of times antedating human history, is very imperfect; but it is sufficiently complete to demonstrate God's law of evolution, and to show that this law acted continuously and efficiently up to the time when the writings of men took up the record. These show that this fundamental law is as operative today as in any of the ages past. Darwin defines a law of Nature as "The sequence of events, as ascertained by us."

To the careful observer one of the most obvious facts is the universal struggle for existence which is seen everywhere in organic nature. In the vegetable kingdom one plant crowds out another; the hardy tree keeps all the sun from its delicate rival, and takes all the virtue from the soil, so that the rival perishes. The herbivora in the animal kingdom feed upon vegetation, and but for the abundance of Nature would destroy it; the carnivora, but for this same abundance of Nature, would destroy all animal life. The weak and old and feeble are eaten by the young and strong. The old lion, who for years has been monarch of the forest, is eaten at last by the cowardly hyena.

¹² *Origin of Species*, Charles Darwin, p. 495.

Variations in structure or form, which are in any way useful, either for defense or for procuring food, or which enable its possessor to survive the vicissitudes of its environment, will tend to preserve that individual and enable him to propagate his kind. So, also, any qualities or adornments which enable him to attract the opposite sex will enable the individual more easily to propagate his kind, and hence these qualities or adornments will tend to become hereditary.

"Individuals having any advantage, however slight, over others, would have the best chance of surviving and procreating their kind. On the other hand, we may feel sure that any variation in the least degree injurious would tend to the destruction of the possessor. This preservation of favorable individual differences and variations, and the destruction of those that are injurious, I have called Natural Selection or the Survival of the Fittest." ¹³

Protective coloring in insects, worms, birds or animals, which renders them inconspicuous and enables them more easily to hide from their predatory enemies is of great advantage. The qualities in any animal which render the individual attractive to members of the opposite sex lead to the condition which has been termed sexual selection. The songs of birds and their gorgeous plumage come under this head, and among the carnivora, strength and courage and fleetness and skill and cunning seem to be qualities that possess great attractiveness to the opposite sex; consequently, these qualities are accentuated and are hereditary. "In all cases the new and improved forms of life tend to supercede and supplant the old and unimproved forms." ¹⁴

"All the living forms of life are the lineal descendants of those which lived long before the Cambrian epoch (Fig. X, opp. p. 72). We may feel certain that the ordinary succession by generation has never once been broken,

¹³ *Origin of Species*, Charles Darwin, p. 74.

¹⁴ *Origin of Species*, Charles Darwin, p. 314.

and that no cataclysm has desolated the whole world. Hence we may look with some confidence to a secure future of great length. And, as natural selection works solely by and for the good of each being, all corporeal and mental endowments will tend to progress toward perfection.”¹⁵

It has been the theory of some, particularly of Lamarck, that what has been styled the Heredity Chromatin was the innate cause producing the inevitable tendency which made for perfection in all organic life, independent of natural or sexual selection. Darwin was unable to agree to this hypothesis that there existed an inherent law or force or tendency which led to constant improvement and beneficial variations in the development of species.

This Heredity Chromatin is defined as a protoplasmic substance in the nucleus of the cell which perpetuates the development of similar ancestral traits or bodily and mental characteristics in individuals descended from the same ancestry, but separated by vast periods of time and reared under entirely different environments. In other words, the genesis of new forms and functions is inherent in the chromatin, according to this theory. This theory has not been widely accepted by scientists.

Let us consider these various developments of animal life a little more in detail. Animal life was first demonstrated in the Cambrian rocks, although it probably existed in the Algonkian. In the Cambrian formation there are found 400 species, of which 100 are Trilobites, and some of these Trilobites were 2 feet in length.¹⁶ In the Silurian seas life was most abundant. There were great varieties of primitive shellfish, and in late Silurian times the vertebrated fish appeared. There were chambered Cephalopods fifteen feet in length, and Trilobites of complicated structure and great beauty, having compound eyes.

¹⁵ *Origin of Species*, Charles Darwin, p. 504.

¹⁶ *Elements of Geology*, Joseph LeConte, p. 312.

In the Devonian age (Fig. X, opp. p. 72), fish were more prominently developed than previously, as were also insects, both having appeared in prophetic types in the Silurian age. The fish of this age were the progenitors of both the fish and amphibians of future ages, and were the highest type of animal life, ruling the seas as Trilobites and Orthoceratites had in previous ages.

In the Carboniferous age existed the most powerful sharks in the history of the world, and also great numbers of sturgeons. This age also produced great numbers of insects. Here appeared the first air-breathing animals, Amphibians, a prophetic type capable of breathing either in the water or the air.

"In the coal measures of Bavaria are found perfect skeletons of an animal $3\frac{1}{2}$ feet long, the connecting link between Ganoid fishes and Amphibians."¹⁷

Among the earliest land vertebrates is the Labyrinthodont, which had both lungs and gills, and thus connected the water-breathers with the air-breathers. They were armored with bony plates over the body and head, the connecting link between the Sauroid fishes which preceded them and the Saurian reptiles which succeeded them. They mark the point of separation between the Amphibians and the fishes.¹⁸

The Appalachian revolution, which marked the change from the Palæozoic to the Mesozoic eras, also indicates the place in geologic history where the record was lost for many millenniums, for reasons which it is not easy to explain. Palæozoic forms were being replaced by Mesozoic forms, which were modified to meet changed terrestrial conditions. True reptiles appear, derived from the amphibians, and through them the mammals were derived. In the late Mesozoic we find a great variety of reptiles of large and small sizes and more complicated

¹⁸ *Elements of Geology*, Joseph LeConte, p. 421.

¹⁷ *Elements of Geology*, Joseph LeConte, p. 418.

construction. From these reptiles were derived the birds, and at about the same time mammals are first found.¹⁹

In the Mesozoic era (Fig. X, opp. p. 72), we find reptiles, birds and mammals of fantastic forms, many of them prophetic of the more specialized and perfected forms of later periods. In the Jurassic period there were flying reptiles; Pterosaurs from 2 to 18 feet in length; birds with long tails and toothed jaws like reptiles. Was it a birdlike reptile or a reptilian bird?

The mammals which first appeared in the Jurassic or in the upper Triassic were insectivorous Marsupials of a reptilian character, a transition or connecting link to true mammals.²⁰

Some of the tracks found in the sandstones of the Connecticut Valley may be tracks of birds or of reptiles or of reptilian birds. In the Jurassic the huge reptiles reached their greatest size, and were certainly wonderful specimens. The Ichthyosaurus was sometimes 40 feet in length, and possessed a head 5 feet long; it had 200 huge teeth, and eyes 15 inches in diameter, provided with bony plates. This reptile was predatory and voracious.²¹

The Dinosaurs of the Jurassic period were the largest animals that ever lived. Some of them were 80 feet in length. They walked on their hind legs, something like birds. Some of these Dinosaurs were small, not larger than our common domestic fowls.²² The Stegosaurus was a most remarkable reptile. It had two rows of broad, bony plates 5 feet in height extending the whole length of its back, and 4 spines at the end of its tail. The Iguanodon was a herbivorous reptile 30 feet in length, weighing more than an elephant. It undoubtedly walked on its hind legs.²³ The Megalosaur was a formidable

¹⁹ *Elements of Geology*, Joseph LeConte, p. 430.

²⁰ *Elements of Geology*, Joseph LeConte, pp. 466-467.

²¹ *Elements of Geology*, Joseph LeConte, p. 454.

²² *Elements of Geology*, Joseph LeConte, pp. 478, 457.

²³ *Elements of Geology*, Joseph LeConte, p. 458.

carnivorous reptile about 30 feet in length. The Ceteosaur was the largest reptile found in Europe. It was about 50 feet long and 10 feet high.

In the Triassic formation, the head of a Mastodonsaurus has been found 3 feet long and 2 feet wide.²⁴ In the Jurassic Crustaceans and Insects also became very abundant.

In the Cretaceous period (Fig. X, opp. p. 72), the reptilian characteristics were impressed upon most of the animal forms; the birds were reptilian in character, and the mammals had not yet evolved far, in form, from their reptilian ancestors. In Great Britain there were 16 species of Dinosaurs, which ranged in length from 20 to 50 feet; 12 Crocodilians from 10 to 50 feet in length, and Enaliosaurs and Pterodactyls. In the United States there were 150 species of reptiles, mostly of gigantic size; these included Mosasaurs, Dinosaurs, Enaliosaurs, Pterosaurs, in addition to immense turtles. The mammals of this period were semi-oviparous, or Marsupials, and while they were present in greater number, they were small in size.²⁵ The birds of the Cretaceous period were provided with teeth like reptiles, while the fishes, which were abundant, were not greatly different from those of modern times. Mollusks, including the oyster, were abundant.

With the passing of the Cretaceous period, the immense reptiles disappeared in a few thousand years; and, as is usual when a race is about to disappear, the Dinosaurs of the late Cretaceous period began to assume various fantastic shapes, due, no doubt, to the fact that they were striving to adapt themselves to changed or changing climatic, atmospheric and terrestrial conditions which would eventually prove fatal to their existence.

In the Tertiary age numerous perfect specimens of invertebrates and insects have been found which are not greatly different from those of our own time. Sharks

²⁴ *Elements of Geology*, Joseph LeConte, p. 435.

²⁵ *Elements of Geology*, Joseph LeConte, p. 512.

from 50 to 70 feet in length swam the seas in the Cenozoic era, and in the Miocene period there were turtles 20 feet long, 7 feet high and 8 feet wide. The huge Enaliosaurs, Dinosaurs, Mosasaurs and Pterosaurs were extinct, and in their places were crocodiles, lizards, turtles and snakes, the crocodiles reaching in this period their greatest state of perfection.

In the late Tertiary, the reptilian birds disappeared and the connecting link also disappeared, so that the birds were very similar to those of our own time.²⁶ In this same period are also found the first true placental mammals, not greatly specialized, but proherbivorous and procarnivorous.

In the Miocene and Pliocene Period of Europe appeared for the first time the saber-toothed tiger and true monkeys (prophetic of man), also the rhinoceros, hippopotamus and elephant, and whales, now extinct, 70 feet in length.

The first specimen of the horse family, about the size of a fox, is found in the lower Eocene; and in the upper Tertiary the brain of the horse gradually increased in size, and in every way the animal has advanced toward its present marvelous perfection.

In the marshes and bogs and pot-holes of America many specimens of the elephant and the Mastodon have been found.

In the Pleistocene (Fig. X, opp. p. 72) is found a mailed beast, the *Chlomydotherium*, which resembled a turtle and was as large as an ox or rhinoceros.

At the beginning of the Quaternary age in North America we find the camel, hippopotamus, rhinoceros, tapir, mammoth and horse, all of them in considerable numbers, and at the same time, man of the old stone age was engaged in the struggle for existence with Nature and the beasts about him.²⁷

The remains of great numbers of Quaternary mammals

²⁶ *Elements of Geology*, Joseph LeConte, p. 540.

²⁷ *Elements of Geology*, Joseph LeConte, pp. 600-602.

(Fig. X, opp. p. 72) have been found in various parts of Europe in bone caverns, caves, beaches and terraces, in marshes and frozen soils. The following are some of the animals found: elephants, rhinoceroses, the hippopotamus, the Irish elk, the horse and the ox, the cave bear, the hyena, the lion and the saber-toothed tiger. In one cave were found the remains of 300 hyenas, 800 cave bears, and in another cavern the remains of 100 cave bears. These bones were undoubtedly the accumulation of centuries, prehistoric man having eaten the flesh which once covered them. They are also an evidence of the powers and skill of prehistoric man, as most of them had been captured and killed in the chase. Twenty tons of hippopotamus' bones have been removed from one cave in Sicily, also the bones and implements of prehistoric men.

The bones of 500 mammoths have been found on the coast of Norfolk and Suffolk, and 200 grinder teeth. The mammoth roamed in large herds all over Europe, and perfect specimens have been found, frozen in the ice of the far North.

CHAPTER VIII

Man is a cousin of the Anthropoid ape, many, many generations removed. When he ceased to be an Anthropoid and became a man no one can tell, as no historian was there to record the event, and Nature, who is one with God, has not dated the record made, but leaves it for us to find out by searching. It is one of the dates which man will never find, for there was no definite moment of time when man ceased to be a beast and became a human soul. It was a gradual evolution. Our Anthropoid ancestor found it wise to come down from the trees and live upon the ground. He found that he could stand upon his posterior legs and walk in the upright position, a thing which no other animal had ever systematically done; and he found that his anterior legs were better suited for many other purposes than they were for walking. He had much better use of his eyes when he was in the upright position than formerly when he walked upon all four legs, giving him a valuable advantage in escaping from his enemies. As his posterior legs were used almost exclusively for locomotion, he developed a greatly increased speed in running, and a grace and ease in movement. As the centre of gravity was better supported, he could endure much more exertion with less fatigue. His anterior legs and feet gradually developed into hands and arms, as the result of the diversified uses to which they were more and more devoted. The "manual training," in which these hands and arms were constantly employed, developed the brain, causing it both to increase in size and develop along special lines. Gradually, through many thousands of years, the beast disappeared, and a man was born, inheriting most of the beastly characteristics of his ancestors.

In his fierce struggle with Nature and the savage beasts about him, intellectual capacity was of more value to this primitive man than physical force; by which it came about that the man with the most intelligence was best able to defend himself from harm, and take to himself, as his female companions, the best specimens of the female sex. As the centuries went on, this constant "survival of the fittest" and this continued natural and sexual selection of the best specimens of each sex led to a constant improvement in both the mental and physical powers.

It has been noticed, in both the animal and vegetable kingdoms, that occasionally a peculiar individual appears, differing widely from his forbears, his brothers and cousins, and these peculiarities are sometimes hereditary, so that a new breed of animals or a new variety of plants is developed. These new developments are sometimes called "sports." It has been suggested, though perhaps never put forth as a scientific theory, that man might be a mutation or a variation from his humble ancestry, and, therefore, a "sport" rather than an orderly evolution from more primitive animals.

The anatomical resemblances between Man and the Anthropoid apes are very close; they have the same number of teeth of almost identical form and construction; the brain structure is essentially the same, as the gorilla differs less in point of brain structure from man than he does from lower orders of monkeys, like the lemur. "Thus, whatever system of organs be studied, the comparison of their modifications in the ape series leads to one and the same result, that the structural differences which separate man from the gorilla and the chimpanzee are not so great as those which separate the gorilla from the lower apes."¹

A study of the skulls of animals, other than man, shows a great development of brain capacity, in many instances, since the Miocene period. The horse of the twentieth

¹ *Man's Place in Nature*, Huxley, p. 144.

century is a much more intelligent beast than his ancestors of the Pliocene period.

The date when man became a man is buried so deep under the obscurities of antiquity that we can never find it, but the geological period which was honored by his advent is fairly certain, and we can feel reasonably sure that man, as differentiated from the beast, appeared in the Miocene period (Fig. X, opp. p. 72), 300,000 years ago. He had not yet attained to the intelligence or ingenuity of the men of the Palæolithic or Old Stone Age (See Fig. Y, p. 114), but he had ceased to be a beast and was moving toward that state of ideal perfection which we of the twentieth century are still striving after, but which is still far in the future.

In times of war and famine with all its horrors, and in face of all the cruelties and injustices of our times, it is well for us to look to the rock from which we were hewn, and to behold the pit from which we were digged, and take courage. For man and his civilization are certainly moving in the right direction. "Thoughtful men will find in the lowly stock whence man has sprung, the best evidence of the splendor of his capacities, and will discern, in his long progress through the past, a reasonable ground of faith in his attainment of a noble future."²

The condition of this Pre-Pleistocene man is hard for us to imagine (Fig. Y, p. 114, and Fig. X, opp. p. 72). He was without the use of fire, perhaps without even a knowledge of its existence. He lived a life of constant terror, as he was liable at any moment to be devoured by the wild beasts about him, against which he had no weapons of defense except his naked fists, and no refuge from their ferocity except the treetops. He was in almost equal danger from the savages of his own species. To the victor belonged the body of the vanquished, and cannibalism was probably universal. Few, if any, of the human species reached old age. When a man was unable to de-

² *Man's Place in Nature*, Huxley, p. 155.

FIGURE "Y"

IRON AGE
BRONZE AGE

PREHISTORIC

NEOLITHIC

AZILIAN	TARDENOISIAN
MAGDALENIAN	UPPER PALAEOLITHIC
(30,000 years ago (?))	
SOLUTREAN	
AURIGNACIAN	CRO MAGNON MAN

MOUSTERIAN	NEANDERTHAL MAN
ACHEULEAN	LOWER PALAEOLITHIC
CHELLEAN	
PRE CHELLEAN	PILTDOWN MAN
	HEIDELBERG MAN
PLEISTOCENE	
or	
ICE AGE	
	TRINIL MAN
EOLITHIC	

fend himself or make himself useful to his associates, or unable to escape from their cannibalistic greed, he was sure to be devoured, either by his fellow-men or by the carnivora about him. This was particularly the fate of the women, especially the elderly women, for there was no mercy for the weak in those centuries.

In those early times men lived entirely upon what they were able to capture in the chase, and this was eaten raw, blood and all, after being torn in pieces by the hands and teeth; it was often in a decomposed condition. Our earliest ancestor wore no clothing, and slept curled up upon the ground, without protection from the weather except in rare instances when he could find a cave not occupied by a lion, or a cave bear, or a saber-toothed tiger or savage men more powerful than himself. The struggle for food was at all times fierce, and starvation was not uncommon. The savage hunters of France were coeval with the woolly mammoth and the woolly rhinoceros. Chastity was a thing undreamed of in this savage breast, for all females were the property of the men who were strong enough to capture them and hold them against all comers. In our days we hang or electrocute men for doing the things which in Pre-Pleistocene days indicated a fitness to survive and propagate the race.

The Quaternary or Pleistocene man was an anticipation or prophetic type of the man of the Old Stone Age, who was to follow him.

Perhaps about 125,000 years ago man had so far advanced in intelligence that he began to use stones as implements, and was learning to sharpen them and shape them for arrowheads, hatchets and hammers. At about the same time he commenced to use the bones and horns of the animals he had slain for implements, and for handles for the stone implements of his grandfathers.

The men of the Old Stone Age 75,000 years ago learned the use of fire, as their hearths are found at the entrances of their caves and at many other places in Europe.

In caves in France and Spain, and other parts of Europe the bones of thousands of horses and hippopotami are found. In one cave in the south of France were found the bones of the cave bear, brown bear, badger, polecat, cave lion, wild cat, hyena, wolf, fox, mammoth, rhinoceros, horse, ass, boar, stag, irish-elk, roe, reindeer and auroch. Many of these bones had been split to obtain their marrow, and some of them had been pounded up in a stone mortar. Many of the implements of the Palæolithic and Neolithic culture are found in these caves among the bones. Human bones have often been found in these caves scattered among the bones of animals, indicating that there was no burial, but that the remains of cannibalistic feasts were as unceremoniously disposed of as the remains of other feasts. Often these human bones had been split open to extract the marrow.

Frequently these cave dwellers, if they made any attempt at a burial, buried one generation on top of another, as has sometimes been done by civilized people in quite recent times.

It must be understood that civilization has never been equally advanced in all parts of the earth. When America was discovered most of the aborigines were in the Stone Age of culture, and there are still races which have advanced little farther. When Western and Northern Europe were still in the Old Stone Age of culture, Egypt and Babylonia and Greece were far advanced in civilization.

The chart on page 114, modified from Osborne, represents the various stages of culture in Europe that preceded historic times, and gives the names of the various races of men who have left their relics, and the evidences of their existence and culture behind them in almost all parts of Europe.

The Piltdown man was perhaps as ancient as the Heidelberg or Trinil men, at any rate his remains are found in Pre-Chellean times, which date back 100,000,

perhaps 300,000 years.³ The Old Stone Age alone probably covered a period in Europe of much more than 100,000 years, followed by the long Neolithic period.

During the residence of these races in Europe there was a severe Ice Age which must have driven them far to the south of France and Spain, and with them there evidently was a great migration of Arctic and sub-Arctic fauna, for we find mingled with the bones and implements and debris of these men the bones of the musk ox, the woolly mammoth, the reindeer and other animals whose habitat is in the cold regions of the far North.

It has been claimed that the Neanderthal man entered Europe during the third interglacial stage and preceding the fourth glaciation; at any rate he was resident there during Mousterian times (See Fig. Y, p. 114), but what number should be attached to the different periods of glaciation is a matter open to argument. Surely the ice advanced well down across the continent of Europe and retreated to the far North more than four times prior to 60,000 years ago.⁴

During all Palæolithic times Europe was inhabited by animals from all climates and all parts of the earth, except America and Australia, and apes and monkeys lived in France and Germany.⁵

In grottos at Le Moustier, St. Acheul, and at Castillo in Spain, and in England, the Neanderthal man has left abundant traces of his existence. He made a continuous residence there from Acheulean up to and through Aurignacian times.⁶

In the grotto at Castillo in Spain debris to the depth of 45 feet has been explored. Prehistoric man from Acheulean to Azilian times (See Fig. Y, p. 114), cover-

³ *Men of the Old Stone Age*, Henry F. Osborne, p. 145.

⁴ *Men of the Old Stone Age*, Henry F. Osborne, pp. 42-43.

⁵ *Men of the Old Stone Age*, Henry F. Osborne, pp. 98-100-101-213-243.

⁶ *Men of the Old Stone Age*, Henry F. Osborne, pp. 200-201-202.

ing a period of many thousand years, lived in this and similar grottos and caves, and contended with wild beasts for their possession. Beside him dwelt the woolly mammoth, the woolly rhinoceros, wild horse, deer, bison, cave bear, badger, polecat, lion, wild cat, hyena, wolf, fox, ass, boar, stag, Irish-elk, reindeer, auroch, all of which he hunted, and upon the flesh of which he depended entirely for food; and upon their skins for clothing.⁷ "The game was dismembered where it fell. The skull was split open for the brain and the long bones for marrow." "It is a volume of pre-history, read and interpreted almost as clearly as if it were in writing."

In the sense in which we possess them, these savages had no names; polygamy, polyandry, infanticide and cannibalism were universal. The old and feeble were either eaten by their own people or turned out to be eaten by the wild beasts in constant waiting for such a meal. While these savages possessed more intelligence than the beasts about them, they possessed none of the virtues of even the most remote civilization.

About 25,000 years ago the Neanderthal man disappeared, apparently exterminated by a better race, which was also much further advanced along the long road to civilization.⁸ This new man was the Cro Magnon of Magdalenian or possibly of Aurignacian times (See Fig. Y, p. 114). This Cro Magnon race undoubtedly came into Europe from the East, probably from the territory north and east of the Black Sea, and they perhaps brought with them the advanced culture which is apparent wherever evidences of their existence are found.

They used the horns of deer to dig the flints out of the chalk beds, and out of these flints and stones, arrow-heads, hatchets, knives, axes, hammers, awls, daggers, chisels, scoops and sling-stones were made.

⁷ *Men of the Old Stone Age*, Henry F. Osborne, pp. 200-201-202-213.

⁸ *Men of the Old Stone Age*, Henry F. Osborne, p. 257.

The Cro-Magnon men were the dominant race in Western Europe through Neolithic times and there are abundant anatomical evidences that many of the peoples of Europe today are descended from these primitive men. "The distinctive features of the Neolithic epoch are: implements of polished stone, a rudimentary knowledge of agriculture, use of plants and seeds for food; implements for the preparation of the soil and for harvesting the crops; introduction of pottery used in cooking; domestication of two breeds of cattle; sheep, goats, horses, pigs and dogs."⁹

In the upper Palæolithic we find the first evidences of art. Rude images carved out of bones, or out of stone, and drawings of animals and men. These drawings possessed considerable merit. During Magdalenian times (See Fig. Y, p. 114) paintings in colors, which have endured to the present day and which evince considerable artistic skill, were made on the walls of caverns. At the same time there was great improvement in implements of all sorts, including bone needles and harpoons.

About this time also men commenced to make what we might call decent interments of their dead. There are great numbers of stone tombs in many parts of western Europe, some of them of considerable extent, and indicating funeral rites of probably great ceremony. Burned human bones have been found in these tombs. Were the victims burned alive or was cremation practiced in these early times? Stonehenge in England is probably one of these large ceremonial tombs.

Stone arrow-heads have been found in the skulls and vertebræ of men of the Neolithic age, indicating that they might have been slain in battle. The shell mounds of Denmark are probably of the Neolithic times (See Fig. Y, p. 114). In these mounds, sometimes 15 feet in

⁹ *Men of the Old Stone Age*, Henry F. Osborne, pp. 498-499-387-391.

height, are found bones of men, shells of oysters, and implements of various degrees of finish.

In the lakes of Switzerland are found evidences of a higher culture than had developed elsewhere during Neolithic times. These industrious people built their dwellings upon piles driven into the lake bottom, a distance of several feet, and protruding above the surface of the lake far enough to allow of the construction of quite comfortable domiciles. By accident, from time to time, they dropped into the lake, considerable variety of articles employed in their domestic economy which were abandoned as lost. These have been preserved, covered by the water, through all the succeeding centuries; and furnish to us a very interesting record of their culture. They made rude pottery for cooking and various domestic purposes; they possessed quite a variety of stone tools very nicely finished, and in later ages some implements of bronze; they had learned to cultivate flax, wheat, barley and millet, and from the flax made nets for fishing and articles of clothing; they had domesticated cattle, sheep, goats and dogs, and apparently lived in a condition of considerable comfort and prosperity.¹⁰

We may judge something of the appearance and condition of the men of Palæolithic and Neolithic times (See Fig. Y, p. 114) by the descriptions given by Darwin and Sir John Lubbock of savages whom they had observed, who, while they had received perhaps something from contact with civilization, were still in the Upper Palæolithic stage of culture. While all the conditions which they describe were not found in every tribe or people whom they visited, still there were observed no great differences between them. They are described by Sir John Lubbock as more filthy than animals, covered with grease, their hair so filled with grease and dirt that it hardens like a cap. In many instances neither sex wore any clothing,

¹⁰ *History of the Early World*, James Henry Breasted, pp. 21 to 24.

and their skins were tattooed or cut in deep and wide scars; often the face was disfigured by holes cut through the lips, in which they wore sticks and ornaments of horn or bone of considerable size. If any clothing at all was worn, it consisted of the skins of animals, extremely filthy and infested with vermin.

The Palæolithic men cannot be said to have had any religion; though they were tormented by fear of evil spirits and all sorts of devils, which were supposed to haunt the forests and inhabit the dark recesses of ravines and caverns, and who must be propitiated by incantations and bloody rites and often by human sacrifices. Heaven, if they dreamed of such a place, was where they could fight and always be victorious over all their enemies, where they could possess an unlimited number of wives, and have an abundance of raw flesh and blood to eat. Their only code of morals was the whim or desires of the strong: the weak had no rights, except such as were allowed them by the strong: and this applies particularly to the females, who were virtual slaves.

Polygamy was the rule and polyandry not uncommon. Among many tribes it was customary to swap or trade wives, and it was a matter of courtesy to lend or provide a temporary wife for a guest. It has been a custom among many savages to bury a wife or two and some slaves with the husband. Where some sort of a marriage contract existed it was often temporary, to be terminated at the pleasure of the man, or at the birth of a child. The women were frequently tied up and whipped, and not infrequently eaten, particularly if they were getting old or were no longer useful; among some tribes they were buried alive.

Cannibals ate the flesh of their victims, not only because they desired it for food, but because it was supposed that, by eating an enemy who had been vanquished, his courage and fierceness and strength would be acquired by the victor. The human victims were torn in pieces by the

teeth and hands of the cannibals, and eaten uncooked, blood and all. Blubber and decomposed flesh were often considered a great delicacy.

At the seacoast heaps of shells covering half an acre and 10 feet deep have been found. In addition to these shellfish, these savages ate roots and wild vegetables, fruits, frogs and snakes, honey and grubs, moths, birds, and bird's eggs, fish, turtles, dogs, seals and whales. The bones were often pounded up by stone hammers to extract the marrow. In later times, after cattle and goats were domesticated, milk was kept in bladders and sacks of skins, and meat was often boiled in blood and milk and considered a great delicacy.

These savages of the Palæolithic times possessed a very limited vocabulary, probably could not count above five, and had no words for the finer sentiments. They probably had little or no idea of the measurement of time, and no idea of the ages of individuals. We may be prepared to believe Sir John Lubbock when he states that these people engaged in dances that were not "decorous."

The following observations of Mr. Charles Darwin will enable us to learn something more of the probable habits of our remote ancestors of the Lithic ages. "The inhabitants of Tierra del Fuego, living chiefly on shellfish, are obliged constantly to change their place of residence; but they return at intervals to the same spots, as is evident from the pile of old shells which must often amount to some tons in weight. * * * While going on shore we pulled alongside a canoe with six Fuegians. These were the most abject and miserable creatures that I anywhere beheld. * * * These Fuegians in the canoe were quite naked, and even one full-grown woman was absolutely so. It was raining heavily at the time and the fresh water, together with the spray, trickled down her body. These poor wretches were stunted in their growth, their hideous faces bedaubed with white paint, their skins filthy and greasy, their hair entangled, their voices dis-

cordant. Viewing such men one can hardly believe they are fellow creatures and inhabitants of the same world. At night five or six human beings, naked, and scarcely protected from the wind and rain of this tempestuous climate, slept on the wet ground, coiled up like animals. Whenever it is low water, they must rise to pick shellfish from the rocks, and the women, winter and summer, either dive to collect sea-eggs or sit patiently in their canoes, and, with a baited hair line, jerk out small fish. If a seal is killed, or the floating carcass of a putrid whale discovered, there is a feast. Such miserable food is augmented by a few tasteless berries or fungi. Nor are they exempt from famine, and, as a consequence, cannibalism is accompanied by parricide."

Prehistoric races have been studied more carefully in northern and western Europe and in North America than elsewhere, because there were no ancient civilizations in this territory to cover up and destroy whatever evidences these primitive men may have left of their existence. Furthermore, northern and western Europe and North America alone can furnish the resident scholarship and scientific training necessary for this line of research.

As we examine into the conditions of Prehistoric man over a period of many centuries, perhaps the thing which most forcibly impresses us is the constant improvement or evolutionary progress. This progress is slow, as are all the operations of the universe, and it can only be noted by a careful study of history and of pre-history, and the application of the principles of the philosophy of history, which is a comparatively new science, understood by few, and quite generally ignored by the earlier scholars. It seems apparent that progress, improvement, constant change to better things, until perfection is reached, is as much one of the laws of God as are Newton's laws of gravitation.

We see man slowly coming up from the beast. As was necessary, the physical man must be developed first, and

it seems that the Cro-Magnon was perhaps physically the equal of the best specimens of our twentieth century. Certainly the ancient Egyptians and Babylonians were superb physical specimens.

Closely following the physical development was the intellectual. But it seems to have been a long time before the moral and the spiritual were developed to such an extent as to greatly influence his character and actions. The men of moral and spiritual insight, like Elijah, Amos, Isaiah and Jesus Christ, Paul, Socrates, Wycliff and Martin Luther, have been the exception, and few of the men of their own times have understood or appreciated them or been greatly influenced *in their conduct* by their teachings. These men, and others like them, were prophetic types, prophetic of the whole body of mankind in a distant future age, just as the Anthropoid ape was prophetic of the Neanderthal man, and the Cro-Magnon man prophetic of the classical Greek.

The physical man is practically perfect; the mental is approaching a state of great proficiency, if not quite yet perfection; moral and spiritual ideas are just beginning to wield an influence, in some quarters, on politics and international affairs. And there is an increasing number of men and women whose private lives are governed by principles of morality and justice.

These principles of domestic morality are some of them found highly developed in animals. The fidelity and affection of the dog can hardly be exceeded, and the mother love of the cow is pathetic, as observed when her calf has been taken from her. "Is mother love vile because a hen shares it, or fidelity base because dogs possess it?" ¹¹

These qualities can only be partially developed in the beast, as his intellectual capacity and breadth of vision are so limited. But man with his greatly enlarged and deeply convoluted cerebrum and his wide field for observation,

¹¹ *Man's Place in Nature*, Huxley, p. 154.

which embraces not only the earth and all upon it, but the whole field of history and science, the literature of all the saints and sages of all countries and all centuries, will be able to fulfill the prophecy, not only of his humble worshiper, the dog, but of his ancestors and brothers who have these many centuries dreamed and prophesied of a new earth wherein shall dwell righteousness.

As man has developed his civilization, he has, to a certain extent, negated two of the fundamental laws of Nature: survival of the fittest and natural selection. He has had to make for himself new hygienic laws to supersede those which Nature provided for his development. When man was simply an animal, he was more subject to the influences of climate, diet and environment, than when civilization supplied him with houses, clothing, and better and more abundant food. Under these latter conditions it was not always the fittest that survived. "The order of Nature is such that an increasing evolution of fitness is possible, and there is adaptation in cosmic evolution." ¹²

¹² *The Bible of Nature*, G. J. Arthur Thompson, p. 26.

CHAPTER IX

Many pages of the Book which God is writing are contained in the history of the human race after it emerged from savagery and slowly picked its way through ignorance, superstition, religious prejudice and intolerance, inexperience, despotisms of opinion and government, poverty, injustice, wars, pestilence and famine. Through all these experiences the race has passed, and many peoples are still lost and wandering among them all, and must struggle yet for centuries before they can emerge from this forest of evils.

A brief glance at advancing civilizations will show us how the law of evolution is working through the history of our race.

In the dawn of history, while it was still largely mythological, we learn that many primitive people worshiped the sun or the moon, or both. The Mikado of Japan, we are told, is descended from the sun, and perhaps some of his loving subjects still believe it. In Babylonia the old sun god Shamash was a great god, and as early as 2000 B. C. the Babylonians' supreme god was called Murduk, who was the sun god, and corresponded to Jupiter of the later Romans. Amenhotep IV of Egypt, 1400 B. C., elevated the sun god to the supreme place, as the only one god, and thus we find monotheism established by law in what is probably the oldest civilization on earth.

The sun and the moon have been considered sometimes as male and sometimes as female by their ignorant and superstitious worshipers. The sun was always the great timepiece for the world, but it must have taken primitive man a long time to grasp and understand the 365 days of the solar year.

We find in Egypt a very early and advanced civilization.

In what was for them the late Stone Age, we find them raising barley and split wheat, and employing irrigation. The Egyptians discovered copper in the wilderness of Sinai about 4000 B. C. and learned something of its use.

The primitive mind on all continents and in every century seems to have been able to grasp and understand only the despotic or monarchical form of government. We find this form of government well developed on a fairly scientific basis in Egypt in 4000 B. C. The Egyptians had an alphabet of 24 letters more than 3,000 years before Christ, and phonetic writing was first developed and practiced by the Egyptians, before which time picture writing had been advanced almost to an exact science.¹

The yearly calendar of 365 days, divided into 12 months, devised by the Egyptians in 4241 B. C., is still used by us. The Egyptians were the first to number the years, after having previously named them from some conspicuous event which occurred in each.

Specimens of pottery of great beauty are still preserved, which were made in 3000 B. C. Between 3000 B. C. and 2500 B. C. the great pyramids were built, Gizeh being completed about 2900 B. C.; and at this remote date the Egyptians maintained large fleets of seagoing vessels, propelled both by oars and sails, which circled the Mediterranean.

Not until 2000 B. C., however, did they build a canal from the Nile to the Red Sea, after which for many centuries their ships passed from the Mediterranean to the Red Sea and the Indian Ocean, and carried on an immense commerce with the far East. This canal, after centuries of use, became filled up, and was abandoned until Darius, about 600 B. C., opened it up again and restored its commerce. A large commerce by caravan was carried on with the interior of Africa and Arabia and western Asia.

¹ *A History of the Early World*, James Henry Breasted, pp. 42-45.

⁴ *A History of the Early World*, James Henry Breasted, p. 126.

Taxes in early times were collected in produce and cattle, so that the King had immense storehouses and large tracts of land for his cattle, which by 2900 B. C. were much like the cattle of the present day. As early as 2800 B. C. copper drain pipes for draining houses were in use, and copper was extensively used in the manufacture of carpenters' and builders' tools.² By 2900 B. C. rings of copper and gold of standard weight were employed as money.

Decorative art had reached a high state of perfection by 2900 B. C.; beautiful tapestry was produced, and some pieces of furniture have been preserved which would be a credit to the best manufacturers of art furniture of the twentieth century. These articles were not only artistic in design and form, but were inlaid with gold and silver, ivory and ebony and other ornamental woods with a skill that could not easily be excelled.

The huge sculpture, the pyramids, the sphinx, the great temples of Egypt have been the wonder of 50 centuries, and probably will be wonders for as many centuries to come.

The immortality of the soul was a doctrine believed in 2500 B. C., as is clearly indicated by inscriptions and numerous articles found in ancient Egyptian tombs. A belief in a judgment day, with Osiris as the judge, was also a tenet of orthodoxy 4,500 years ago. Written records were kept on rolls of papyrus, which were preserved in glass jars, and on one of these rolls a noble records his good deeds and kindly acts towards widows and orphans, virgins, and the poor, in a manner to indicate that he at least appreciated many of the virtues, and endeavored to practice some of them.

The decimal system of numbers was in use, and simple astronomical instruments were used much as today.

Horses and chariots were introduced into Egypt from Asia some time prior to 1600 B. C.; and by this time

² *A History of the Early World*, James Henry Breasted, p. 62.

Egypt was the ruler of Asia Minor, and, to some extent, of Greece. These historical facts relating to Egypt have been gleaned from *A History of the Early World* by James Henry Breasted.

A short study of the history of other eastern countries will help us realize how universal is the application of the law of evolution in the history of the human race.

Before 3000 B. C. a Sumerian civilization was flourishing on the plain of Shinar. Mud bricks were used for making houses; cattle had been domesticated, and oxen were used to draw two-wheeled carts. No domesticated horses were used at this early date. Barley and split wheat were raised. Picture and cuneiform writing had been perfected. The years were still named, not numbered. Their unit for numbers of considerable size was 60, from which we derive our 360° of the great circle, and our 60 seconds in the minute and 60 minutes in the hour.³

This Sumerian civilization had a myth to explain the presence of death and suffering in the earth, which reminds us of the old Hebrew myth of Adam and Eve, which has been perpetuated by the modern church and is still believed by some good, though simple, people. Their myth was that the South-wind goddess overturned the boat of the fisherman Adapa (the same as Adam?). He flew into a rage and broke her wings, for which he was summoned into the presence of the Sky-god, and was offered the bread and water of life, which would have made him and the whole human race immortal; but this he refused; hence, death and condemnation came upon the whole human race.⁴

As early as 2100 B. C. written codes of laws were in existence in Babylonia, and instructions from a governor to his lieutenants have been found on clay tablets, bearing this early date.

Gold and silver were in use in Babylon as early as

³ *A History of the Early World*, James Henry Breasted, p. 112.

⁴ *A History of the Early World*, James Henry Breasted, p. 126.

2100 B. C., but probably not made into coins until the time of Darius about 600 B. C.

The Indo-Europeans probably brought the domesticated horse into western Asia about 2500 B. C., but he does not appear to have been used in Babylonia until 2100 B. C., and not in Egypt until 400 years later.

Regular schools for boys and girls were in operation in 2100 B. C.

A great library of 22,000 clay tablets had been accumulated in Nineveh by 700 B. C.

Iron, which had been discovered in the country of the Hittites, and which had come into common use by 1100 B. C., was first made into weapons of war and used by the Assyrian Army.

Horses, cattle and sheep were in use by the Medo-Persians 2500 B. C.⁵

For many centuries nomadic tribes made frequent or occasional raids upon the more settled communities, either urban or agricultural, for purposes of plunder, or to secure more favorable or comfortable residences for themselves. The migration of the Hebrews from Egypt to Palestine about 1250 B. C. may be considered as one of these nomadic raids. At approximately the same time the Philistines were driven out of the Island of Crete by the invading Greeks, and settled in southern Palestine, to be a thorn in the flesh of Israel for hundreds of years.

The Hebrew blood was by no means kept pure, for frequent marriage alliances were made with surrounding tribes, especially the Hittites, until the Hittite type of head and face was firmly fixed upon the Hebrew, and remains one of his inheritances until the present day.

The first historical writings of the Hebrews date from about 850 B. C. Amos uttered his terrible prophetic warnings about 750 B. C., and was followed some 50 years later by Isaiah, the greatest of the literary men of the ancient Hebrews. The books of the Old Testament

⁵ *A History of the Early World*, James Henry Breasted, p. 174.

were collected and edited by pious Jews after the return from the Babylonian captivity, and under the patronage of and by the express order of Cyrus.

For a very complete and concise summary of the history of Israel and Babylonia see *History of the Early World* by Breasted.

In the history of Greece and its people we can trace the progress of one people, living in one place, from the Bronze or Iron Ages to the present day; and can find in that one country every phase of barbarism and civilization, and every form of art and expression of culture that the human mind has so far developed. In the fields of art and literature it is safe to say that the Greeks have never been excelled, perhaps never equalled. For many centuries all the civilization worth mentioning was Greek, though much of it was not in Greece. Wherever the Greek, even the Greek slave, went, Grecian art and literature and culture and thought went with him, and dominated these fields in his new home. Even imperial Rome at its best would hardly have risen above barbarism had it not been for Greek thought and culture. We of today owe so much to these old Greeks that no man can estimate the debt, and future ages, for all time, will look back to Greece as the mother of much that has made life worth living.

Between 2000 and 1000 B. C. the Greeks had conquered and possessed all of Greece and the shores of Asia Minor; coming, as a nomadic tribe, from the shores of the Caspian, or the country north and east of the Black Sea. The Dorian Greeks entered the Peloponnesus about 1500 B. C. and conquered the Achæans and Aegeans, Greek tribes which had preceded them. About 1200 B. C. they drove the Philistines out of Crete, and completely possessed the territory of this warlike tribe. The Greece described by Homer may be dated at about 1200 B. C. Before 1000 B. C. iron had come into quite common use in Greece for all sorts of domestic purposes, as well as

for weapons of war. By this time also the Greeks were engaged in quite an extensive commerce in the eastern Mediterranean. About 1100 B. C. the Phoenicians were importing large amounts of papyrus from Egypt, and had invented and introduced into Greece an alphabet of 22 letters. By 650 B. C. reading and writing were common accomplishments among all classes in Greece.⁶ In 500 B. C. Greek art had attained its highest state of perfection, and Greek commerce reached all points in the Mediterranean and extended even beyond the pillars of Hercules. Gold and silver coins were in general use. The population of both Athens and Corinth at this time was about 25,000 in each city.⁷

It should be noted that before the introduction of writing a "rememberer" was appointed in many Greek communities, whose duty it was to remember treaties and various transactions and events of importance.

It has been said by some wise man that the Greeks were children. They exhibited all the vacillation, disloyalty, brutality, immorality, cunning and superstition of half-grown boys with brilliant intellects, but no family training to impress upon them the value of domestic and public virtues. Like half-grown boys at play, they were continually quarreling among themselves, and often refused to follow the wisest leaders, or to adopt and follow a wise, conservative and consistent public policy.

All the weaknesses of a democracy were displayed by the Greek states, and only a few of the blessings and advantages of a government by the people were realized. This was partly because they had no models or examples to follow, for, up to this time, outside of the family, patriarchal or tribal governments, only military despotisms had been successful. Then, too, the private and public virtues, which are so absolutely essential to the stability of a republic, were not possessed by a large proportion of

⁶ *A History of the Early World*, James Henry Breasted, p. 271.

⁷ *A History of the Early World*, James Henry Breasted, p. 301.

the people, and their value was not known. The form of democracy was exceedingly crude, not adapted to a highly emotional and largely ignorant populace. But they were trying the experiment of self-government, and their mistakes and successes have been, and will be, of the greatest value to the world. Many of their mistakes the Greeks were able to correct as the years went by. The great Athenian poet-statesman, Solon, gave a new constitution, greatly improved the condition of the poor, and made a more equitable distribution of the land, firmly establishing the principle of trial by jury.

By the year 500 B. C. Athens was practically a democracy. The principles of toleration of political opponents had not yet been reached in the evolution of civil government in Athens, and as a result she often either ostracised or executed her wisest and best citizens. This ostracism was not permanent banishment, for the period of enforced absence from Athens never exceeded 10 years, and was later reduced to 5 years, and it was not considered even an unmitigated disgrace. It was simply a temporary retirement of a popular leader in order that those who were not in favor of his methods or ideas might carry out their program without his opposition. It was something similar to what occurs in England, France or the United States when a political leader is defeated at an election, and is temporarily out of office. Property rights, civil rights, or honors were not affected by ostracism. Under the influence and leadership of Alcibiades this custom was abolished.

If the theories of government, or a military expedition, had not worked out to the satisfaction of a majority of ignorant Athenians, the citizen held responsible for the failure was often driven from the city, and, not infrequently, he joined himself to the enemies of Athens or of all Greece, and gave to these enemies the best services he was able to render.

In the fifth century the music of the flute and the lyre

might often have been heard in the houses of cultivated Athenians, and singing was looked upon as a most desirable accomplishment. The lyric poets Sappho and Pindar were in great favor, and their songs were often heard in the public gatherings of the city.

By the year 450 B. C. there were six thousand men in Athens who served as jurors and who were regularly paid out of the public funds. These jurors were practically the lawmakers of Athens as well as its courts, and constituted a powerful class of political parasites who did little to benefit the state. In many instances the higher officers of the state were chosen by lot, which certainly did not place the best men in the important positions of the government. The commanders of the army were quite generally elected.

In the age of Pericles the population of Athens had perhaps reached 100,000, and it may have been three times that number. The annual revenue was about \$750,000, and the Athenian statesmen had already appreciated the value and convenience of an export and import duty, which was levied at 1%. Nothing more beautiful in sculpture or architecture has ever been produced than was to be found in Athens during the ascendancy of Pericles, and much of it was produced as the result of his patronage and authority. He used the treasures of the league at Delos, and taxed the island cities and the colonies to build these wonderful buildings and monuments in Athens. He did not hesitate to collect taxes by force, if necessary. Pericles seems to have been not only a man of transcendent abilities, but possessed of many lovable qualities. He seems to have had a genuine affection for his "unmarried" wife, Aspasia, who was a very brilliant woman, and for his children. He required the attendance at the courts in Athens of those living at a great distance, if they wished to carry on their causes at law; this resulted in a great injustice to many people.

The sanitary arrangements in Athens were very crude;

the streets were narrow and dirty, the repositories of every form of filth; there was no street cleaning and no drainage, and no water supply except from springs, which must often have become seriously contaminated. We have reason to believe that the morals of the city were as unsavory as the streets and springs. The private houses, which were mostly low and made of brick, could not have been very comfortable dwellings.

Athens was the home of philosophers and thinkers of every type; of poets, orators, dramatists and historians, and by these men were discussed all the great problems which have perplexed the human soul since man emerged from the darkness of the Palæolithic ages. Thought was free; there was no inquisition to examine into the orthodoxy of the opinions of philosophers, and every subject was discussed with absolute freedom. Socrates was given the fatal cup, not so much on account of his philosophical opinions, as because he had been the gadfly tormenting the conceited leaders, showing up their ignorance and general incompetence.

Human sacrifices had been discontinued in the early history of the Greeks, and in the times of Pericles and Socrates cruelty and torture were not practiced. Even the slaves were kindly treated, often emancipated, and many of them were highly educated.

There were certain standards of orthodoxy from which it was not thought wise to dissent openly, but where there was such widespread intelligence, such amazing power of thought and such broad discussion, there was sure to be developed a "new theology" much as we have seen in modern times. In the fifth century B. C. the sophists taught that there was no evidence of the existence of any Greek gods; and Euripides, the agnostic dramatist, not only cast doubts upon the infallibility of the gods, but upon some of the theories of life that had been currently accepted in the philosophies of Greece. On the other hand, Sophocles and other dramatists and poets clung

to the old theology and the old gods as "good enough" for them.

Socrates was a profoundly religious man, but not in the modern sense; neither did he believe in all the gods of the Greeks. On one occasion, as described by his disciple Plato, he remarked that the popular belief was good enough for him, and, in the next sentence, stated that he did not subscribe to it.

The teachings of Socrates embodied the highest standards ever reached by pagan philosophers. He advocated the practice of all the virtues, as he understood them. His understanding of them was not identical with the teachings of Paul, but did not greatly differ: temperance, continence, chastity, truth, kindness to all, forgiveness of enemies, obedience to law, courage, and a willingness to fight to the death for what was right; a desire to plant the truth, and a love of virtue in the hearts and minds of others, at no matter how great cost to himself; love of his wife and children, were some of the virtues which he commended and practiced. He accepted no payment for his teaching; he had no greed for money; he loved his country and his city, and would not leave it to save his life.

Plato was the great idealist of Grecian philosophy, who dreamed of a great republic, and had visions of the good time coming which is yet far off. Thucydides was the first to discover a philosophy in history, and to understand that events occurred as the natural sequence of preceding events and not by accident. Prior to 400 B. C. there were in existence in Athens banks, not unlike those of our day, which took deposits and loaned money at interest on suitable securities.

All these great and wise Greeks were prophetic types of the men of a civilization which is just dawning after more than 2,000 years of waiting and groaning, travail and hope. They visualized only a part of civilization; they saw through a glass darkly, and could not even dream

of much that is commonplace in the civilization of the twentieth century.

The old Greeks could not develop a national unity and could not subordinate personal interests for the general good, and so, as a governing people, they could not rule a growing world.

The Olympic games were held at Olympia, a beautiful valley in Elis, once in 5 years, in honor of Zeus, the father of all the gods. All internal strifes or wars between the different Grecian states were suspended during the games, and all Greece assembled to witness them. There was no brutality about these contests; they were simply tests of skill and strength entered upon after 10 months of intensive training. There were races for boys, and foot races for men. Some of these were simply short dashes, and some of them were miles in length, and were great tests of endurance. Then there were races in heavy armor, especially designed to train men for military service. There were contests in jumping, leaping, vaulting, throwing the spear. Horse races and chariot races were a prominent feature of these games, all of which were designed to develop strength and skill, and to promote beauty in the human form. The victors were crowned with garlands, cut from a sacred tree, and were accorded great honors, both at Olympia and upon their return to their own cities. After the games were over, at least one day was devoted to sacrifices to the gods, to libations, processions and banquets. Only one woman, a priestess, was allowed to witness these games, or participate in the festivities which followed them. We, perhaps, can easily guess the reason why.

Other countries had developed learning to a considerable extent prior to 400 B. C., but Greece alone had developed culture. Her artists, sculptors, architects, poets, orators, dramatists and philosophers will probably never be excelled, and will remain the models for all future generations. But a democracy which was able perma-

nently to stand alone could not be developed until the nineteenth century A. D., and in a distant and unknown hemisphere. The evolution of the human mind and soul had simply not yet reached that stage where a successful democracy was possible.

Philip of Macedonia, and his greater son, Alexander, were to give Grecian learning and culture that wide dissemination which could only be attained in that age of the world by the assistance of a powerful and widely flung despotism. By 323 B. C. Alexander had extended his empire into Asia beyond the Indus, was master of Egypt, and had founded the city of Alexandria, which was soon to become a great centre of Grecian intellectual achievements. Alexander of Macedon would not be called "The Great" today; he was a great beast, a great egotist, and probably a great general, but sublime selfishness was his greatest characteristic.

The Hellenic age, covering a period of about 300 years from the death of Alexander the Great in 323 B. C., saw a development at Alexandria of Grecian literature, art and science which far surpassed anything which had preceded it. Aristarchus of Samos discovered and taught that the earth and the planets revolve about the sun. Erastosthenes measured the size of the earth with great accuracy. Water clocks were in use for telling time. In Alexandria was a museum for the study of anatomy, as well as a library which contained, in written and accessible form, all the wisdom of the world. The first Greek grammar was written by Dionysius in 120 B. C.

The three great philosophers of Athens were Aristotle, Zeno and Epicurus, whose teachings on the conduct of life and its duties and pleasures have probably had more influence in shaping the lives of thinking men than any others except the precepts of the Christian church. Aristotle dominated the thought and teaching of intellectual Europe almost down to our own day.

In Grecian culture, abstract intellectuality reached per-

haps its highest attainable level; it may be that the world will see nothing finer, but the practical application of this intellectual development to the affairs of everyday life, to the comforts and refinements of living for the great masses, to the development of mechanics and chemistry and agriculture, and above all, to the development of a civil government by the people, which should guarantee life and liberty and equal opportunity to all, was compelled to wait yet many centuries. The human mind, except for a few cultivated Greeks, was still bound by authority and needed a master, and people could understand no form of government but a despotism; but the despoticisms were growing more tolerant. Alexander ruled his world better than any of the despots who preceded him; and the great Roman Empire, which was soon to follow, was probably even more tolerant. God's great law of evolution has never ceased to operate, not even for a moment. After the physical man had reached a point where his physical organization was nearly perfect, it took thousands of years for the mental or intellectual man to attain to the heights of the Greeks of Socrates' day, and with this mental evolution there were prophetic signs of the moral growth which was to be the next step in man's long journey from the Stone Age to the Heaven upon earth which is sure to come as the centuries roll by. History teaches us that everything cannot be done at once. One people develops some particular phase of civilization, while it may be greatly lacking in most of the other elements which go to make up a civilized state.

As Greece had stood for culture, so Rome, a little later, stood for power and an organized government, which, for efficiency and justice had not, up to that time, been equaled. While the Romans were brutes, they succeeded in disguising their despotic power and brutality with a thin veneer of Grecian culture until a very good imitation resulted. The moderns have inherited from Rome much in the way of law and order, discipline and organization;

but the Grecian veneering of Rome was not so thick but that the beastliness and rottenness and brutality showed through, and streaked and stained, if it did not actually destroy, the Grecian mantle she had assumed.

By 241 B. C. Andronicus, a Greek slave in Rome, had translated the *Odyssey* and the Greek tragedies and comedies into Latin, and by 200 B. C. the Greek system of banking and brokerage was in general and extensive use in Rome.

Slavery was always a Roman institution, and the city of Rome ever furnished a ready market for slaves from all parts of the world. It was a profitable business for pirates to steal free men on all the coasts of the Mediterranean and sell them in Rome for slaves. It was further the general practice to sell into slavery all captives taken in war, and at one time 150,000 slaves were taken from the Dalmatian coast. These slaves were generally treated with great harshness, though it was quite the fashion for wealthy Romans to keep educated Greek slaves, some of whom, like Epictetus and Andronicus, were men of so high an order of culture that they have won a permanent place among the immortals.

The gladiatorial contests and the fights with wild beasts, which were such a joy to the Roman heart, had none of the refinements of the Grecian games, and did not develop the minds and bodies of the Romans as all the Greek contests had done for the Greeks. They simply developed brutality and checked the progress of civilization in Europe for centuries. There was not enough manly virtue in Rome to hold the empire together, and so it fell in pieces of its own weight. The barbarians of the north would have been powerless to enter Rome if the Roman citizen had added courage and virtue to his intelligence.

The time had arrived, in the evolution of the individual and of the state, when the private, domestic and public or civic virtues were of the first importance, both to the

individual and the state. But few of the Greeks and fewer of the Romans understood this, with the result that after the Roman Empire came the deluge. All of Europe was in a turmoil for centuries.

CHAPTER X

We observe a close analogy between the geologic history of the earth and the history of vegetation; and between the history of the animal kingdom and the development of man; and later, between the development of civil government, and a moral and spiritual consciousness.

The same laws of evolution control in each of these departments. First the Plutonic rocks were formed by the cooling surface of the molten mass of which our earth was made; these rocks were rent by volcanoes, heaved and twisted by the volcanic forces beneath them, and disintegrated by chemical action. The disintegrated particles were deposited in the bottoms of the oceans to the thickness of many thousands of feet, and these sedimentary rocks were in turn thrown up thousands of feet by the internal pressure, often covered by volcanic lava, and turned over in every conceivable shape. The sedimentary and lava rocks were in turn disintegrated by chemical agents and the solvent action of water, and were washed down into the seas and converted into sedimentary rocks again.

Thousands of feet of rock were scraped by ice until there was little left, and soils, composed of ground-up rock and vegetable and animal products, were deposited upon them. All this was perhaps immersed in the sea for millions of years and covered with the debris of aquatic life to the depth of thousands of feet, after which it emerged from the ocean, to be once more subjected to the processes briefly described above.

In this way was the surface of the earth fitted for the development of vegetable and animal life. In the animal kingdom lower forms were ever being displaced by those which were higher and better, more complicated and

possessed of greater mentality. Ponderous beasts, whose fossil skulls indicate that little brains were encased by them, wandered over the earth with apparently no function to perform except to devour immense quantities of vegetation. Thousands of species of these uncouth and cumbrous beasts perished to make room for the next higher species, until at last man emerged from his simian ancestry. The prehistoric man has perished, making room for the man of historic times, and this latter man has improved immensely since the dawn of history.

We note the same evolution in civil government and ethical culture, and observe that the earlier and cruder forms of culture have been replaced. The civilizations of the Egyptians, the Medes and Persians, Babylonians and Hittites and others prepared the way for Greece to develop a crude and unworkable republic, which was a prophetic type of what has since reached greater perfection in Great Britain and France and America.

Rome developed law and order and centralized executive power, and veneered her civilization with Greek culture until it seemed as though her empire was to be not only universal and eternal, but the center and source of learning for all times. But this Romanized Greek civilization was not the kind upon which could be built the ideas and institutions of the twentieth century. It had to be ground up and disintegrated, as were the rocks of the early world, and perish as had the earlier civilizations. It had to be sifted and stratified, and while it contained the materials out of which modern civilization were to be made, these materials must be tested by fire and the volcanic action of wars and insurrections, persecutions and tortures, blood and horrors beyond description.

The savage Germanic tribes of the north were the instruments which God employed to initiate this metamorphosis. Ever since before the days of Cæsar's wars in Gaul these German tribes had been pressing hard against the frontiers of Roman dominion, and while they had been

kept at bay they had never been conquered by Rome. Cæsar himself had retired rather precipitately from an encounter with the Germans which he called a victory, and which he naively states he had carried far enough to vindicate the honor of the Roman name. The Roman Empire was scores of years in falling, but perhaps we may put the date of its end at A. D. 476, which date may mark the commencement of the middle ages or, as often called, the dark ages. These ages were dark because the light of civilization almost flickered out, and where there is little light there can be little progress.

The German pagans of the north had no literature and no art, no theory of government except force and plunder. The beautiful specimens of Grecian art had no merit in the eyes of the barbarians, and statues and carvings and decorations of priceless value were ruthlessly destroyed and thrown into heaps of rubbish. That Grecian architecture which Rome had copied and changed, and whose majesty and beauty will be the admiration of all time, possessed no more value in the eyes of these pagans than a mud hut on the Rhine or a cave in the rocks of Bavaria. Beautiful buildings were torn down, often for no reason, and the materials of which they were made left unused upon the ground to be buried beneath the accumulating debris of ages, or used for the construction of roads or other buildings.

As these men from the north could neither read nor write, they possessed no literature of their own, and looked with contempt upon the literary men of Rome, considering as useless rubbish the parchments which contained the literary gems of the ages. We know that much of the ancient literature was lost, but how much and what was its value no one can tell. Much was preserved in the monasteries and in the obscure retreats of recluses; but for about 1,000 years there were few people who could read these manuscripts, and many of the monks who could

read them and who copied them knew nothing of their meaning and little of their value.

For 600 or 700 years the Latin language was little known, even by the priests; and quite frequently the priest who read the services of the church did not know their meanings. A knowledge of the Greek language had practically disappeared in the west, so that all the literary treasures of centuries were literally buried for more than 1,000 years.

CHAPTER XI

The church was as corrupt as ignorance and bestiality and sin could make it. Various religions from Asia and Egypt were popular in Rome during the first century A. D.¹ "All these faiths had their 'mysteries,' consisting of dramatic presentations of the career of the god, especially his submission to death, his triumph over it, and advent into everlasting life. It was believed that to witness these things and to undergo certain ceremonies of initiation would bring to those initiated deliverance from evil, the power to share in the endless life of the god, and to dwell with him forever."

Multitudes were attracted by the comforting assurances of these oriental faiths, and the blessed future insured by their mysteries. Prominent among them, and the only one that long survived, was that off-shoot of Judaism which has developed into the modern Christian church.

The Alexandrian Greeks under Ptolemy I developed a trinity, with Osiris as the father, Isis the mother, and Horus the son, who was equal to the father, and grew up to assume his father's name Osiris, and take his place as a god. The collective name of this trinity was Serapis. Serapis was spoken of as "the savior and leader of souls, leading souls to the light and rescuing them again. He raises the dead, he shows forth the longed-for light to those who see."² "We can never escape him, he will save us, after death we shall still be the care of his providence."³

Isis, the mother goddess, "attracted many devotees who

¹ *A History of the Early World*, James Henry Breasted, p. 66.

² *Outline of History*, H. G. Wells. Vol. I, pp. 413 and 414.

³ *Forerunners and Rivals of Christianity*, Legge, quoted by H. G. Wells in *Outline of History*. Vol. I, p. 413.

vowed their lives to her. Her images stood in the temples, crowned as the queen of Heaven and bearing the infant Horus in her arms; candles were burned before her. The novice was put through a long and careful preparation; he took vows of celibacy, and when he was initiated, his head was shaved and he was clad in a linen garment."

Up to the Christian era, and after, the only form of civil government that had been long successful and able to maintain its authority over a wide area was an unlimited despotism, and early in the history of the mother church, the "fathers" evolved a system of ecclesiastical and spiritual despotism, which, with the theology of her various reformed "daughters," has been the cause of more physical and mental anguish than all the wars of the last 2,000 years.

It has seemed to be a part of the divine plan that the human soul and mind must be held in bondage and fear, deprived of all its rights, passing days and nights in terror, spending years in mental anguish, not only for its own supposed sins, but for the sins of a far-off ancestor. Men were terrorized by an account of an everlasting torment and a burning pit, of the lake which burneth with fire and brimstone, into which all men deserved to be put, and into which all were surely going unless they availed themselves of the only means of escape, which could be procured only of the church. The church secured a monopoly of salvation by assuring all men that there was no other name under heaven, given among men, whereby they might be saved.

Horrible descriptions of the torments of purgatorial flames and the fires of hell have been poured into the ears of little children, too young to understand anything but the horror of it, for nearly 2,000 years, and this fiendish mental torture is allowed to go on "in the name of the Lord" in all parts of the world. Good people are importuned to give of their substance that this diabolical

stuff may be sent to the heathen, who are "perishing for the bread of life."

Some excellent moral precepts have been incorporated with this devilish theology, which have acted as a condiment or flavoring extract, making it more easily swallowed by an ignorant and trusting world. In some "communions" it has been persistently taught that a saintly life, full of good deeds and marked by unselfishness in every action, was no passport to eternal bliss, but only an encouragement to a false hope, which was closely akin to the hope of the hypocrite and would surely lead to perdition.

It was one of the problems of the nineteenth century, which has been passed over to the twentieth century for solution, whether the world has yet reached that stage in its evolutionary history when a democracy, a government of the people and by the people, can long endure. This problem seems to have been solved in the western hemisphere, and by Great Britain and France, but in most other countries it is still a question which waits an answer. So in the spiritual realm, it is still a question whether or not mankind can worship God "in the beauty of holiness," without the overshadowing despotism of a hierarchy whose theology is supremely absurd, lacking a shadow of truth, whose history would seem to indicate that the devil was its source of inspiration. Certainly those bodies which have broken away from the mother church, and eliminated from their creeds some of her fictions, have not shown and are not now showing that virility which promises a glorious and successful future. Democracy in the church must and will follow democracy in the state. Perhaps the world must wait yet for centuries before ecclesiastical and spiritual despotism can be sent along that road over which political despotisms are now so rapidly moving.

The Dark Ages were the product of a political cataclysm which reminds us of the physical cataclysms of the Car-

boniferous or Cambrian ages. Greek art and culture, Roman law and genius for government, were covered over with Germanic savagery, and in it all was a modicum of primitive Christianity which was early corrupted by priestcraft till Jesus Christ would have recognized in the church little for which He lived and died.

Politically, the barbarians were no more able to replace the Roman government which they had destroyed with a just and stable government of their own, than they were able to appreciate the art and literature of Greece or the majesty of Roman law and justice. For centuries there was in Europe government only in spots, and much of the time and in most places it was chaos. Not until the time of Charlemagne was there a government able to maintain order, administering some sort of rude justice over an extended area and with reasonable regularity.

For this reason feudalism flourished over much of Europe for many centuries. As a general government failed to give protection, the people were forced to appeal to some local leader or lord about whom they could rally, and who would organize them into a small army and lead them in battle against invaders or plundering neighbors. These feudal lords or robber barons were at constant war with each other for purposes of plunder or for extension of territory, but, as there was little security for life or property, except under their protection, the great body of the people were obliged to range themselves under one or another of these lords.

As a result of the constant wars and consequent interference with domestic life, the growth of population was small and the great mass of the people was wretchedly poor. There was little encouragement for agriculture or the useful domestic arts, for the plundering over-lord took all there was, and the miserable peasant was fortunate if he had a hut in which to sleep on his bed made of straw or branches from the trees of the forest. He was sometimes fed, at irregular intervals, from his master's table, but

more often he depended upon his luck in the chase and the products of his crude agriculture.

For many centuries, during the Dark Ages, life offered few sources of enjoyment; ignorance was complete and dense. There was no literature accessible to anyone, except the monks and priests, and these were often too ignorant to read it. Superstition held complete dominion over the minds of all. Witchcraft was universally believed in, and was fostered and perpetuated by the church. Devils and fairies, evil spirits and demons, were believed to be all about, in the rocks and forests, streams and glens, in the animals and often in human beings.

We can hardly imagine the discomforts of living or the unsanitary conditions which prevailed at that time. To the difficulties of daily life were added the certainty of purgatory and the probability of hell. A man was likely to be persecuted and burned at the stake for whatever he believed or did not believe. Thousands were burned for magic, witchcraft, sorcery, heresy and orthodoxy, and we can well imagine that in those ignorant times few people knew what they did believe. It seemed necessary for individual initiative to be crushed out of Europe and everything brought down to one level of orthodoxy before modern Europe could commence its work of modern civilization.

Throughout the Dark Ages, with all its wars, its chaos and its lack of progress, there was one institution that steadily increased its power and perfected its organization until it held complete control over the bodies and minds and souls of men. The right to think with that brain which God had spent millions of years to develop, and which is the crowning glory of His creation, was denied. That intellect which has weighed the stars and measured their distances and determined their chemical composition, mapped out their orbits and produced the telephone and the telegraph, the automobile, the steam engine, and the thousand devices of modern times; which is conquering

disease, and will surely drive superstition from the minds of men; which has made life a joy and comfort instead of a terror, was not allowed to be used. The church was a political organization which compelled people to contribute their money to its support under threats and promises. The church assumed absolute authority over the thoughts of men and never hesitated, when she had the power, to imprison and burn any man or woman who dared to think. The long list of her martyrs need not and cannot be incorporated here, for the names of countless thousands of them have been forgotten.

While the church condemned sorcery and witchcraft and magic, one of its chief bulwarks was the performance of miracles. *The Lives of the Saints* is full of accounts of miracles which the faithful were compelled to accept on pain of death: the statue of a saint bowed its head to a penitent who was kneeling and praying before it; marvelous cures of diseases were effected by visiting certain shrines; fearful epidemics were visited upon the people, or else they were stayed by the interposition of some saint; and to the present day these wonder stories are credited by a large portion of the faithful.

The church arrogated to itself the supreme political power. It claimed the right to anoint or depose kings, and in a thousand ways interfered with the civil power in every government in Europe. As might be expected in such a state of society, the clergy and the heads of the church were as corrupt as the wonderful opportunities afforded them would allow. One needs only to read the history of the Dark Ages, or such works as the *Memoirs of Benvenuto Cellini* to learn something of the corruption and luxury and abuses of the medieval clergy. They seldom believed in and seldom practiced that form of religion which does justly, loves mercy and walks humbly with God, and keeps its possessor unspotted by the iniquity of the world. We do not read that men and women were burned at the stake for breaking the Ten Command-

ments or neglecting to follow the teachings of the Sermon on the Mount, but they were burned by the tens of thousands for the slightest doubt as to the correctness or truth of the most insignificant point in the theology of the church, or for the least doubt as to its spiritual authority.

But we must give the church its due; it would not be just or wise to do otherwise. For 1,000 years it preserved much of the ancient literature, which probably otherwise would have been lost; and in scores of monasteries the ignorant monks copied all the books of the Bible and the classics of Greece and Rome, thus preserving for us much that adds to the joy of living. Then, too, the monks and priests ennobled labor, making of it, in many instances, the test of both dignity and merit. For many centuries, under Roman rule, the manual labor of Europe had been largely performed by slaves or serfs, and it was considered beneath the dignity of cultured people to work. This stigma upon labor was largely lifted by the monks, who often spent much of their time in arduous tasks cultivating the fields, draining the swamps, cutting down the forests, erecting buildings. If work is Heaven's first law, these men were obedient to it.

Until the days of the early church there is no record to show that any organized effort was made to care for orphans or foundlings. These unfortunate little creatures were dependent upon the chance care of whoever might find them, and often, in many countries, were left to perish from exposure and starvation. It is to the credit of the early medieval church that the first organized and systematic care of these little waifs was undertaken by her in the name of the Lord.

The care of the old, the sick, the feeble and the dying was also undertaken by the church, and has been to the present day carried on with great success and according to the best standards of medical and sanitary science. This and the care of children constitute the two human

qualities which have strongly appealed to sympathetic hearts of all nations now for nearly 2,000 years.

The Roman church was never friendly to human slavery, always sympathized with slaves and encouraged and approved their emancipation. The church contended that all men were equal before God, as His children, and that social conditions were human and temporary, and the servility of slavery incompatible with the plan of God's kingdom. When the church became supreme, it was customary in many places to publicly emancipate the slaves as a part of the church service on Sunday, or on some special occasion of religious rejoicing.

To the Catholic church is largely due the attitude of civilization toward marriage, divorce and the family. In this matter, as in many others, the church has assumed to declare, "Thus saith the Lord," when it was not the Lord but the church that spoke, and that with no authority from God. Marriage and the family were institutions in existence for thousands of years before the church was ever heard of, and will be venerated institutions of civilization thousands of years after the church, as we know it, is forgotten, buried deep in the rubbish of antiquity.

The prehistoric man, and the man of early historic times (and, for that matter, the man of the present day in many countries), took to himself as many wives as he could capture from his rivals, or purchase from their fathers, or steal away from their husbands, often with the connivance of the coveted women. Often their number was limited only by his ability to secure them or support them and their children. This was no sin in the times of Abraham and Jacob and David and Solomon. It was the custom and they had no reason to see any wrong in it. It was not the fact that he had numerous wives that led David to compose the wonderful penitential psalm after he had taken Bathsheba, but the fact that he had caused the death of her husband to get her; and Nathan

denounced him, not for polygamy, but because he had taken from a poor, helpless man all that he had and then caused his death. With all his penitence, David kept the handsome lady, though he had numerous other wives.

In the childhood of the race the strongest, wisest, bravest man was the best to propagate his kind, and it was best for the development of posterity that he should be the progenitor rather than his weaker and less intelligent rivals. What was right then is not right now, in the civilization of the twentieth century. In the course of ages affection has taken the place of purely animal instinct in many of the human race; and sympathy and a consideration for the feelings of the partner of many years, an appreciation of her trials and pains and anxieties in rearing her children, and a more correct understanding of the rights of women, have led normal, virtuous men to see that to take plural wives was an injustice to each of them, especially the first one, and hence, monogamy has come to be the only right and lawful state of marriage.

We must remember that women are not as strong as men, and that it is only in quite recent centuries that there has been any respect shown to weakness. Because the woman could not fight like the man, he considered her simply as a piece of property to be acquired and used and disposed of as best suited his convenience, and not as suited her feelings. Even in this country at the present time there are men who hold this view of the female sex. The present dignified position of women in the marriage state is due to the slow processes of evolution, and not to any church.

The present attitude of the Catholic church, and its attitude for centuries towards marriage and divorce, has been shockingly immoral, if by immoral we mean that which is wrong. Until recently in some Catholic countries, perhaps even now, there was no way provided for Protestants to be married. Marriage was one of the

sacraments of the church, and could only be administered to those who were baptized and members of that church. Children born of marriages arranged outside of that church were illegitimate. In the United States the church tolerates mixed marriages from necessity, but frowns upon them. This attitude towards marriage is a specimen of unexampled impertinence on the part of the church. It is no more a matter for church dictation than other domestic matters.

Marriage is a contract of the most solemn character, which should be entered into only after careful consideration, and which should be annulled only for good and sufficient reasons; but there *are* good and sufficient reasons, and when those reasons exist, a divorce should be granted, and the right to remarry should not be denied. There is nothing written in God's Book that justifies the assumption that divorced persons must not marry.

Another matter greatly to the credit of the early and medieval church was its effort to protect the chastity of the female slave. Its success was not always brilliant, but its attitude and rules were commendable.

It seems to have been the plan of God, as written in this Book of Human History which He is writing, to reduce all men down to the same low level of intelligence, faith and practice, in order that modern civilization might be built up free from the polytheism of the ancient Greek and Roman culture. God is not an economist, and does not hesitate to throw away a period of culture when it has served its purpose, so that He may make room for the next higher stage in human development.

As the mountains are thrown up by the forces of the interior earth, and are then worn down by great masses of ice, and ground up to make soil for the use of man, so the Grecianized Roman culture was destroyed by Germanic tribes, and then the church ground it up beneath the weight of 1,000 years of ecclesiastic despotism until nothing was left but a dead level of ignorance and super-

stition and vice, which made a soil in which modern civilization could grow. After this theological incubus had produced 1,000 years of mental and spiritual paralysis and death, a resurrection occurred, and mankind lived again.

As a means of producing this unity of faith, the Catholic church invented and perfected the art of persecution, the like of which has never been seen in earth or hell before. The fathers failed to read, "Judge not that ye be not judged." "Blessed are the meek." "Blessed are the merciful." "Love your enemies" and do good to them and "All things whatsoever ye would that men should do to you, do ye even so to them." For centuries it was taught that eternal punishment by fire would be the portion of all those outside the church, and for all those in the church who were guilty of heresy. Persecution and death by burning was an act of mercy because it prevented the growth and spread of heresy, and saved the souls of future generations from a like damnation. It added to the torture of these miserable heretics to burn them by a slow fire, that the agony might be prolonged, and serve as a lesson and warning to the beholders. Tens of thousands of Manichæans were slain by the church, and countless other thousands "for the glory of God," after suffering indescribable tortures.

In the year 1208 the Inquisition was instituted by Pope Innocent IV, the object of which was to drive heresy from the earth. Its horrors none but God can tell. 31,000 were burned in Spain alone, and equal numbers in other parts of Europe. 290,000 in Spain were condemned to other severe punishment.⁴ "By a decree of the Council of Constance in 1415 the remains of Wycliffe were ordered to be dug up and burned, an order which was carried out, at the command of Pope Martin V, by Bishop Fleming in 1428."⁵ The same council caused the burning

⁴ *Rationalism in Europe*, Lecky, Vol. II, p. 40.

⁵ *Outline of History*, H. G. Wells. Vol. II, p. 96.

alive of John Huss, because he was not a coward and dared to think, although his safety had been guaranteed by powerful influences.

For centuries the pagan world had believed in oracles and magic, astrologers and demons, nymphs and devils and supernatural spirits, much as some people of the present day believe in fortune-tellers and palm readers; and in Rome there had been laws for the suppression of these arts. Under the Roman Emperor Constantine magicians were thrown to wild beasts, crucified, tortured and their flesh torn from their bones by iron hooks.

It had always been an established doctrine of the church that the Devil and his angels were ever active about the Christian, tempting him every moment; but then, as now, the Devil was desperately afraid of holy water, and a few drops would drive him off, or the sign of the cross, or uttering the name of Mary.

It eventually became a universal belief in the church that certain persons were in league with Satan, had sold themselves to him, and that he would assist them in any evil work. These supposed witches were generally elderly women who had sold themselves to the Devil for purposes of carnal intercourse, in return for which he was at their service. After the tenth century this doctrine appears to have been in great favor, and one of the chief duties of bishops and priests was to hunt out and torture witches. The Black Death in the fourteenth century was followed by many trials for witchcraft, and practically no suspected person was acquitted.

It is estimated on good authority that more than 9,000,000 people were burned for witchcraft in Europe in the course of a few centuries. The church of Rome used every effort to stimulate the execution of witches. The burning of these poor creatures was preceded by tortures too horrible for contemplation; their bones were broken; their fingers torn out; their eyes cut out; spikes were thrust into their flesh; they were kept awake for days;

stripped of all their clothing and subjected to indignities and tortures which the mind of this century cannot imagine. After the torturing had continued for days it was ended by burning in a slow fire. The world and the church had no pity for their suffering.

"In 1484 Pope Innocent VIII issued a bull which gave a fearful impetus to the persecution of witches, and he commissioned Inquisitor Sprenger, who is said to have condemned hundreds to death every year. A similar bull was issued by Alexander VI in 1494, by Julius II in 1504, by Leo X in 1521, and by Adrian VI in 1523." ⁶ 7,000 were burned for witchcraft at Treves; 600 by the bishop of Bamberg; 800 in one year in the bishopric of Wurtzburg; at Towlouse, 400 in a single execution; Remy, a judge at Nancy, boasted that he had put to death 800 witches in 16 years.⁷ The executions for witchcraft in Paris were beyond computation.

Witchcraft was one of the many fictions which Protestantism took over from the mother church, and in protestant England and Scotland the persecutions for witchcraft were as numerous and cruel as in any Catholic country. In Geneva, under Calvin, 500 witches were executed in 3 months. Martin Luther and John Knox were firm believers in witchcraft and zealous for its extermination by the death of all those found to be guilty of a compact with Satan. Even John Wesley was a believer in witchcraft, and the Scotch clergy as late as 1678 tortured and burned witches in the most horrible manner.

⁶ *Rationalism in Europe*, Lecky, p. 32.

⁷ *Rationalism in Europe*, Lecky, p. 29.

CHAPTER XII

The persecution of the Jews was a form of heresy-hunting that was especially dear to the Christian heart for several centuries. Jews had been cruelly persecuted and massacred by pagans and Mohammedans, but it was reserved for the church to go the limit; and that great body may rest in peace, assured that in no past age have its barbarities and injustices been exceeded in any cause or against any people, nor will they be exceeded in the future.

The Jews have been a great factor, perhaps the greatest factor, in the preservation of civilization and in the humanizing of humanity. For these many, many centuries they have worshipped the one God, in spite of all the terrors and tortures that pagans and Christians could invent, and this worship has been free from the fantastics which have added variety to the worship of all other creeds. It has always been safe to persecute the Jews, for they have always been in the minority and it has always been profitable, because the Jews, by reason of their industry, economy, intelligence and business sagacity, have always accumulated wealth, which it was easy to seize as these poor creatures were stripped and driven to death or exile, which was often worse than death.

The Jews have always been students, and in whatever country exiled, they have always stood with the best in their knowledge of history, philosophy, law, grammar, rhetoric, mathematics, astronomy, theology, exegetics, poetry and medicine. Partly through their close contact with the Arabs and the Moors their scholarship was undoubtedly the highest in Europe from the tenth to the eighteenth centuries. Modern civilization owes a debt to the Arabs which is often not appreciated. The Arabs were pioneers in mathematics, algebra, geometry, trigo-

nometry and astronomy. They invented the pendulum. Much that is known about medicine came from the Arabs. In all the sciences they were original investigators and leaders. They made glass, pottery, dyestuffs, and worked in all the metals; excelled in agriculture, and horticulture, and introduced the manufacture of paper into Europe. Probably they learned the manufacture of paper from the Chinese.

The Jews were always quiet, law-abiding people, domestic in their habits, and if, in the centuries of injustice through which they have lived and thrived, they have developed a certain skill in "spoiling the Gentiles," it can undoubtedly be attributed to the treatment they have received.

In the fourteenth century in Spain the Jews were continually driven from their homes, robbed of their possessions, and burned to death. In one year 280 were burned in Seville alone. In 1492 Ferdinand and Isabella (of blessed memory) issued an edict ordering all Jews to leave Spain within 4 months, unless they were willing to embrace Christianity and be baptized. To add to the cruelty not one grain of gold or silver were they allowed to take with them out of Spain. What else of value could they take? It was proposed by the wealthy Jews that, if all Jews could be given immunity from the effects of this edict by its revocation, a large sum in gold would be paid, and these two pious sovereigns were inclined to take the bribe. But they were assured by Torquemada, the Dominican Inquisitor, that if they accepted this Jewish gold they would thereby place themselves in the class of Judas Iscariot, who sold his Lord for 30 pieces of silver. Consequently the Jews were driven out. Of course, it was the Christian duty of this most Christian king and queen and of the holy church to seize all the gold and valuables of these infidel, blaspheming Jews before they left the country, and use it for "*the glory of God.*" From 300,000 to 800,000 Jews, variously estimated, were driven out

of Spain in utter destitution at this time, to perish in the Atlantic or the Mediterranean, or to starve in Africa, to be sold as slaves, the females to be sold into the harems of the Turks. A few were baptized into the church, and some fled to Portugal, from which country they were soon driven out with equal horrors.

In 1680, during the festivities which followed the marriage of Charles II of Spain, many Jews and Jewesses were burned for the amusement of the populace. A Jewess 17 years of age, said to be very beautiful, appealed in vain for mercy to the bride of the king. What an awful commentary on the church which professed to imitate Him of whom it was said: "A bruised reed shall he not break, and smoking flax shall he not quench," and again: "I will have mercy and not sacrifice."

The persecutions of the Jews were equally atrocious in the other countries of Europe. In France, from the eleventh to the fourteenth centuries, massacres and plunderings were frequent. Louis IX, "for the benefit of his soul," appropriated to his own use a third of the obligations held by Jews against his subjects. In 1306 all Jews were expelled from France, but in a few years they were allowed to return on condition that two-thirds of all that was due them should be forfeited to the king.

The cities of Germany were not behind those of France and Spain in their persecution of Jews, and their streets were deluged for centuries with the blood of these persecuted children of Abraham.

England was a little better than these other countries apparently because she did not have as many Jews to kill. In 1290, after plunderings and massacres as horrible as the imagination can picture, the Jews were all driven from England.

It seems to have been a necessary part of the divine plan of evolution that these centuries of persecution should do their work to prove to all future generations that the human mind cannot be driven either to accept

or abandon a belief, by persecution; neither can the truth itself be buried or destroyed by force or ridicule or sophistry or persecution. "Truth crushed to earth shall rise again. The eternal years of God are hers." If this thing be of God you cannot destroy it, and if it be not of God it will perish.

For several hundred years the church was not in sympathy with the drama; actors could receive none of the rites of the church, and the faithful were forbidden to witness theatrical entertainments; but, at a later time, the church made use of religious dramas for the instruction and amusement of the people, and largely withdrew its wholesale condemnation of actors and theatres.

At the same time, and for centuries, the monks and church officials disapproved of the possession of works of art, especially statuary, which had been made by pagans. Hence, many pieces of priceless value were destroyed as being likely to be inhabited by demons or devils. "Most of the statues that had been transported to Constantinople and had survived the fury of the monks were destroyed by the Iconoclasts, the Crusaders or the Mohammedans." ¹

¹ *Rationalism in Europe*, Lecky.

CHAPTER XIII

In the twelfth century Europe began to show slight symptoms of waking from its 1,000 years of intellectual sleep, and there began to be a revival of the study of Latin literature. Occasionally a man might be found who dared to think, though he did so at the peril of his life.

Not only in matters of religion, but in science, the church assumed to decide what was truth, while it possessed none of the qualifications to decide in either case. The theories of Copernicus, which were first promulgated in 1543, were condemned by the church as late as 1616, and the condemnation and imprisonment of Galileo occurred soon after.

The church has never been able to learn that its condemnation of a scientific proposition does not alter the facts; and that evolution will crush all that opposes it, regardless of the venerable character of its opponents, or the sanctity of the robes which envelop them.

Modern civilization may be said to have had its beginning at the time of the invention of printing, about 1450, and it is noticed that it advanced at about equal rate, if not along identical lines, in many of the countries of Europe and America. Nations are, like individuals, possessed of different gifts, which they are able to improve for the benefit of all in their own peculiar way.

Modern civilization could never have developed without the art of printing and the making of paper. It was necessary that the Book which God is writing, not only in inanimate nature but in the hearts and minds of men, and in the great political, social, intellectual and moral movements of history, should be printed so that all men might read. "He that can read hath the keys of knowl-

edge," and the art of printing has made it possible for millions to become learned who else must have lived and died as ignorant as the beasts. Among these millions an occasional genius appears, who, but for the art of printing, would have lived and died in ignorance and obscurity. By reading he became wise, and the world was blessed by a Shakespeare, or a Newton, or a Watt, or a Pasteur, or a Lister, or a Roosevelt.

The Reformation, initiated by Luther and his coadjutors and contemporaries, could never have accomplished its great work had it not been for the art of printing, which made it possible for the masses of people in many countries to be informed of their right to think in God's world. This great revelation made to mankind by the Reformation marks a new era in the world's history. For 1,000 years it had been considered the most heinous of crimes to think; men could break all the Ten Commandments and violate every precept in the Sermon on the Mount with comparative safety, but if they did a little independent thinking, torture and the stake were sure to be their portion, though their lives conformed to every tenet of morality, and they loved the Lord their God with all their minds and souls and strength.

Martin Luther was, perhaps, the bravest man that ever lived; at any rate, he was not afraid to face the devil in human form, and all the devil's angels were not able to put him to flight or to recover for their master that domination over the human soul which he had held for more than 1,000 years.

It was assertion and maintenance of the right of independent thought and private judgment which were the crowning work and glory of the Reformation, and not the theology of the reformers. For these had taken over from the mother church most of her fictions and superstitions, and 400 years has still not eliminated them from Protestantism. Satan still goes about in the Protestant

churches like a roaring lion seeking whom he may devour, and the faithful are daily "tempted of the devil."

A religion which has originated in a barbarous age and in a crude civilization will inevitably, whatever may have been the purity of its original faith, be loaded with superstition and perverted by priestcraft. As civilization advances, this theological load will greatly hinder its acceptance by intelligent people, and it is sure to degenerate into a despotism of dogmas which have nothing to do with a saintly life. The church must modify its theology or perish. Advancing civilization and generally diffused intelligence will not accept or tolerate the horrible medieval theology which so far the church of Rome has refused to change. That church is medieval still; its belief in miracles and holy water, and in the efficacy of the sacraments has not changed in 500 years. It is safe to say that in all that time it has learned nothing.

"In addition to the truth of the doctrine of evolution, indeed, one of its greatest merits in my eyes is that it occupies a position of complete and irreconcilable antagonism to that vigorous and consistent enemy of the highest intellectual, moral and social life of mankind, the Catholic church."¹

The sentiment attached to a symbol explains the attitude to the church of many honest, simple, pious souls. It is the church of their fathers, in which have been solemnized the marriages of their ancestors for centuries, and into the membership of which all of their blood relations have been inducted by baptism and confirmation. Their beloved dead have been assured of a blessed immortality through the efficacy of its sacraments, who else must have perished eternally in the fires of hell. Why should they not venerate its clergy, and love and obey its services and commands? The fact that the horrors from which it promises to save them are pure fictions, and that

¹ *Darwinians*, Huxley, p. 147.

it is the chief purpose of the church to make them mental slaves, is not apparent to ignorant and trusting souls. Spirituality is not required of them, neither is growth in grace; only trust the church and attend its services, and the trip through purgatory may be arranged on vestibuled Pullman trains, with diners and sleeping cars attached.

The physical and moral and spiritual world are one, and the same God rules over them all. Evolution is His great law, revealed to us in Nature and in the history of mankind. We may rest assured that no church can forever keep in bondage the minds and souls of men. Ignorance and gullibility have been its only hold upon men in the past, and will be its only hold on them today. Men are fated to be freed from political, economic or industrial, spiritual and ecclesiastical bondage, but how soon this freedom will be attained we cannot tell. The gullibility of the human race is past comprehension; let an ignoramus announce some utterly ridiculous method of the cure of disease and how quickly numerous people will flock about him! Or let the same ignoramus get a Bible and start a new religion which is to save the world, and thousands of people will flock to him.

Nothing could more clearly show the medieval character and the absurdity of the claims of the Roman church than the following verbatim extracts from recent newspapers, and a magazine issued by the church:

"The Dominican Fathers will conduct a mission at St. Joseph's Church from October 19th until November 16th. Rev. * * * stated this morning: 'The object of the mission is to offer extraordinary opportunities for worthily receiving the sacraments and hearing the word of God. The church enriches with wonderful favors those who make the mission well, and it is earnestly hoped that not one member of the parish will fail to profit by this season of grace.' An indulgence of seven years and two hundred and eighty days can be gained by all who attend five of the evening sermons; a plenary indulgence for those attending the evening sermons, receive the sacraments and pray for the intentions of the Pope; a second plenary indulgence can be

gained by all who receive the sacraments during the mission and pray for the intentions of the Pope; a third plenary indulgence can be gained by those who attend all the exercises of the mission for three days continuously; confession, communion and prayer for the Pope's intentions; a fourth plenary indulgence can be gained in the form of the Papal blessing by all who attend at least half the exercises of the mission. Conditions: Confession, communion and prayer for the Pope's intentions. All who attend the mission should be present at the closing exercises when the Pope's blessing is given. During the mission the extraordinary indulgences of four hundred eighty-five years and fifty days can be gained for each public recitation of the rosary. In addition to this, fifty years once a day can be gained."

The following advantages are offered to those who subscribe to a certain magazine, or contribute liberally of their money:

SPIRITUAL BENEFITS

For Our Subscribers

In Our Home for the Blind we have the Great Blessing of Adoration of the

MOST BLESSED SACRAMENT

which is a source of so many graces for those whom it has been established for.

Hour by hour the Blind kneel in turn, and while they adore, half of each hour is given to the Holy Souls.

THE ROSARY IS SAID EVERY HOUR

for your departed ones. This is a very special privilege, and one that should encourage all to participate in its benefits.

Imagine the Blind kneeling in the silence of the Chapel, and there pouring forth their petitions for their benefactors. When you are about your daily duties, and not thinking of your spiritual needs, those poor Blind are supplicating for you and your children, and by their prayers averting many dangers that you will never know until you stand before the great Judgment Seat.

THE HOLY SOULS ARE REMEMBERED

most fittingly. Anyone who may wish one of his dead prayed for in perpetuity can send to the Home of the Blind Ten Dollars and the name of the person is placed on a list.

WHERE THE BLIND PRAY

It would be a fitting memorial for a devoted son or daughter to place on that list the names of deceased parents; such an act would be well worthy a dutiful and affectionate child.

WE ASK YOU TO HELP THIS GREAT WORK

to benefit your own soul and the souls of your deceased relatives and friends.

We promise you in return the following spiritual advantages:

All the Sisters and the Blind will offer special prayers three times a day for your intentions, and the souls of your deceased friends and relatives.

THERE ARE EIGHT NOVENAS OF MASSES,

2,500 Masses and a special remembrance in 5,000 Masses during the year for all solicitors, benefactors and members.

Each person donating the sum of Fifty Dollars will have his name, or that of a deceased relative or friend, engraved on a marble tablet for honorary members in the Chapel of St. Joseph's Home for the Blind.

Address all correspondence to

Mother * * * * *
* * * * *

* * * * * Street

"Provide for your soul while you are alive, and do for yourself what you would wish your heirs to do for you. How soon are the dead forgotten by the living! The heirs enjoy their fortune, while the deceased suffers in Purgatory and vainly exclaims: 'Have pity on me, at least you, my friends, because the Hand of the Lord hath touched me.' If you wish never to be forgotten and to have prayers and Holy Masses offered for the repose of your soul, make a donation to St. Joseph's Home for Aged Blind, or a bequest in your last will in favor of them."

"Any solicitor who sends us the names and addresses of *fifty new subscribers* during the year will have his or her name entered on our *perpetual membership list*, and will share in all the benefits given to Perpetual Members of the *pious union of prayer*, during life and after death. Those who secure *one hundred new members* within the year will be enrolled as *honorary members*, and will have their names engraved on the *marble tablet* in our Chapel at the *home of the blind*. Besides the benefits of Perpetual Membership, a special *high mass or requiem* is offered once a month for all whose names are recorded on the list of *honorary members*."

God's ways are not as our ways, and His thoughts are not as our thoughts. The current theologies of Christendom have overlooked this fact. They have made God simply a big man, moved by the same emotions, delighted with the affection or adoration of men and women, angry

when human beings do what the theologians say they should not do: a God to be teased into doing what He otherwise neglects to perform, just as a father or mother may be teased by a determined child to do what they did not intend. A God who may be induced to change His mind if teased long enough by enough people, just as a trimming politician may be induced to change his mind as often as expediency suggests.

While the confessions of faith in some Protestant churches have not greatly changed in 300 years, it is safe to say as the devout Scotch Presbyterian lady said: "These things are not taken seriously now." When men are allowed to think, they will correct their own errors, and when a proposition has been tested by science and experience and common sense, if it fails to stand these tests, it will no longer be accepted as the truth. Thousands of men and women all over the earth are searching for the truth in all departments of science, and when a truth is found, that means that one of God's laws has been discovered by searching, and one step more has been taken toward finding out the Almighty.

All education should be religious, because it should be an imparting of truth, and truth is a major part of religion; if the things taught are not true, they have no part in true religion. In the past education by churches or denominational bodies has been so overloaded with ecclesiastical or theological dogmas as to be almost worthless and often harmful.

The late Jonathan Edwards found the "doctrine of election" a very "sweet and comforting doctrine," in that, as men were the natural enemies of God, and justly deserved eternal damnation, it was an act of great mercy that He had "elected" that some few should be saved, and had "elected from all eternity" that all the rest of mankind should be damned. The world has grown wiser since then, and this doctrine has only to be stated to receive that ridicule and contempt which it deserves. It was an in-

vention of men, and is nowhere recorded in the Book which God is writing.

The miracles of our day are the miracles of science, not the suspension of some of the laws of God, but the intelligent application of those laws by men who have found them out by searching.* What could be more beyond the dreams of fancy than the telegraph or the telephone or the wireless telegraph or telephone? How easy it would be to convince the most intelligent man of a century ago that these things were the direct work of the devil, or of spirits, or of God himself, if only you kept him in ignorance of the actual methods of their operation! Equally miraculous is the airplane, the automobile, the modern printing press, the sewing machine, the steamship and hundreds of other devices of inventive genius. These things are all a part of the great Book that God is writing in the history of the world; and greater things than these are to follow, for, since man's mind has been liberated from the curse of theological orthodoxy, he has been free to search out the laws of God and think for himself. No stretch of the imagination will cover the wonderful revelations of God and His laws which the next century will disclose.

CHAPTER XIV

In no field have the revelations of science been more wonderful and beneficent than in the fields of medicine and surgery. The physician whom you know may be an ignorant man, probably a conceited man, and perhaps not a very good man; but he belongs to the greatest of the professions, to which humanity owes more than can be computed, a debt which only eternity can pay. By the use of anæsthetics all pain has been eliminated from surgical procedures, and thereby have been rendered possible many operations which otherwise could not be performed. In hospitals all over the world every day hundreds of operations are performed which save the lives of people, and add many years to their usefulness. Are not the names of Lister and Pasteur and Morton more worthy to be placed in the halls of fame than that of the proudest statesman, or the commander in a hundred battles?

Equally brilliant are the triumphs in the field of medicine. Asiatic cholera used to sweep over the world and carry off hundreds of thousands of people. It will never again gain a foothold in any community where the advice of educated physicians is heeded. The bubonic plague, which, in the Dark Ages, decimated Europe, will never again gain a foothold where modern sanitary rules are observed. Smallpox, which once caused the death of $\frac{1}{3}$ of Europe's population and disfigured the rest, will never again occur in a civilized community. The mortality in diphtheria, within the memory of many physicians now in active practice, was about 50% ; under present methods of practice and sanitation the mortality is about 8% and the number of cases comparatively few. Yellow fever has been driven from all civilized communities, and

malaria is largely, if not completely, under control. In maternity cases, in private practice among cleanly people, the mortality is now probably about 1 case in 500 as against an unknown but frightful mortality up to the middle of the nineteenth century.

These are but a few of the many instances in which medical science has triumphed over disease, and these victories are due entirely to the patient searching out of God's law by earnest, devoted and devout men and women. These laws were not handed down, written upon tables of stone, but were revealed to the humble searcher.

A few diseases, like cancer, consumption, influenza and pneumonia still defy the efforts of science, but are we not justified in hoping that in the near future they will be as completely under control as are cholera and yellow fever?

CHAPTER XV

As we consider more particularly the intellectual and spiritual side of man, we find the law of ceaseless conflict as operative as it was in the physical or material. Man is blessed or tormented by many instinctive fears, which are race memories, coming down to him from a remote past. Fear of the dark seems to be almost universal among little children. This is a race memory of the time when outside of the cave where he dwelt, the darkness was inhabited by the lion, the bear, the hyena and the tiger, against which he had no weapons but his naked fists. The fear of snakes seems to be the remnant of a race memory of that time when the naked body had no protection against the serpent hidden in the underbrush and likely to strike him from its ambush at any moment. The little child is afraid of strangers, not because he has ever been injured, but because he has an inherited fear dating back to the time when all strangers were brutes, and when the mother carefully and constantly instilled into its mind the necessity of escape and the advisability of hiding from the stranger whose motives were uncertain, and likely to be evil. The fear of lightning and thunder is due to another of these race memories, which is almost universal among ignorant adults and little children. This fear is an inheritance from the time when the lightning was supposed to be the shafts thrown by an angry god, and the thunder was his voice.

Eclipses and conjunctions of stars, earthquakes and epidemics of fatal diseases have been attributed to the wrath of the gods for thousands of years, and this has furnished occupation to astrologers, soothsayers, magicians, fortune-tellers and palm readers without number.

Many people of intelligence and who are without super-

stition "see things" when alone on a lonely road at night, and these same people "hear things" when alone in a large house at night.

These fears are the negative side of the ceaseless conflict which has gone on in nature, and represent man's attitude towards those forces with which he was unable to contend successfully. These fears are reflex or negative functions which require no thought or intelligence, and are inherited from the ancestors of the old Stone Age or further back.

Perhaps we see these ancestral reflex traits more clearly marked in women than in men. Woman has always been the weaker vessel, not able to protect herself and her children by brute force, and hence obliged to depend upon her cunning and her resources other than strength when her male protector was not at hand. The physiological function of the woman is to perpetuate the race, for which purpose she must find a father for her children; hence, those arts and smiles and tricks of the toilette which will attract and please the male and which are as natural to her as the shape of her teeth or the color of her hair. For countless ages the father of her children was all that stood between her and her children and starvation. He must not only find them food, but must defend them from the carnivorous beasts that were ever ready to devour them. She must make herself so pleasing to her lord that no other women would be able to absorb so much of his attention that she and her children would be left unprotected. These coquettish ways are as much a part of her nature as that mother love which nothing can extinguish, which is properly termed "the greatest thing in the world." Woman should no more be criticized for the one than for the other.

Man was always a gregarious animal, for only by union in the herd or pack was there safety for the individual, and when the woman had picked out the strongest in the pack to be the father of her children, she had also selected

the fittest for that purpose. Natural and sexual selection had been operating upon our simian ancestry for millions of years before the beast-man was evolved, and we know not how many millions of years have elapsed since man separated from that ancestry. When variations in intelligence became of more importance than physical conformation, then the development towards man commenced.

The development of speech, which must have been a very slow process, opened the way for tradition, history, poetry, science, philosophy and sociability long before the art of writing was ever dreamed of. This development of speech must have commenced very early, at least not later than when man ceased to be an animal, and perhaps earlier, as we are led to believe that certain apes and monkeys have a limited vocabulary which they use in conversation among themselves. It seems certain that dogs understand something of human speech, though unable to reply articulately.

When man was simply an animal, matters of sex gave him no concern. Promiscuity was the universal rule, and the females belonged to the strongest, who for that reason were the fittest to propagate. Seed time and harvest and reproduction, in all its forms, were early deified by primitive man, as they typified the perpetuity and salvation of the race. It seems probable that permanent wedlock was a neolithic achievement, and that monogamy is a custom of comparatively recent adoption.

The long and plastic period of infancy and childhood in the human race made the development of parental and filial affection an inevitable consequence. Conjugal affection was a natural consequence of the long years of care and mutual solicitude for the growing child. Their loves and hopes and fears for the helpless infant were identical, and how could the parents avoid loving each other, when each loved the child so much and the child in turn loved them both? As these experiences, both personal and an-

cestral, were registered in the plastic growing brain of the child, the beginnings of a moral nature were developed. In the lower orders of animals there is no infancy, and, hence, little that can be termed morality.

This prolonged infancy, the deeply convoluted brain and extraordinary teachableness are the characteristics of the *genus homo* and the causes of human advancement. The furrows and creases in the human brain increase in number and depth if the brain is used in study and thought till old age. These furrows and creases and convolutions are much smaller and less in number in the peasant and the working man than in the thoughtful scholar.

Feelings of affection for the brothers and sisters and youthful companions of the growing child would naturally develop, and later for the clan or tribe which gave him protection. Here we have the beginnings of ethics, conscience and morality and loyalty.

In the evolutions of the past we find a prophecy of continued improvement in mental and moral and spiritual natures, and we are able to perceive that physical and mental evolution must precede altruism.

CHAPTER XVI

Unconscious evolution has no conscience; it is entirely material; it is the survival of the fittest, which means the one most in harmony with his environment and able to overcome or subdue all competitors. In our age of the world we have the higher stage of evolution working beside the lower or material stage.

We have the man of ideals who is striving for better things, and who is willing to lay down his life for the good of others. This man often meets the fate of Jesus Christ, because his ideals are not in harmony with the thoughts of his contemporaries, and personally he is an irritation to those who have no sympathy with his altruistic notions; so the best way to get rid of him is to stone him or crucify him. His ideals are sure to survive, though his personality perishes. This idealist is a prophetic type, and heralds "the coming of the Lord."

We of the twentieth century are in the midst of this glorious conflict; the better and higher ideals are slowly prevailing, but we must still make human sacrifices on many battlefields before the mental and moral and spiritual in man is able to rule the world, and eliminate physical strife. Where has this idea been expressed more beautifully than by Julia Ward Howe?

BATTLE HYMN OF THE REPUBLIC

Mine eyes have seen the glory of the coming of the Lord;
He is tramping out the vintage where the grapes of wrath are stored;
He hath loosed the fateful lightning of His terrible swift sword;
His truth is marching on.

I have seen Him in the watch-fires of a hundred circling camps;
They have builded Him an altar in the evening dews and damps;

I can read His righteous sentence by the dim and flaring lamps;
His day is marching on.

I have read a fiery gospel, writ in burnished rows of steel;
"As ye deal with my contemners, so with you my grace shall deal;
Let the Hero, born of woman, crush the serpent with His heel,
Since God is marching on."

He has sounded forth the trumpet that shall never call retreat;
He is sifting out the hearts of men before His judgment seat;
Oh, be swift, my soul, to answer Him; be jubilant, my feet!
Our God is marching on.

In the beauty of the lilies Christ was born across the sea,
With a glory in His bosom that transfigures you and me:
As He died to make men holy, let us die to make men free,
While God is marching on.

Kindness, unselfishness, sympathy, love for humanity, have not been exercised long enough by enough people to have established a racial inheritance which will make them "second nature" to all men. Their opposites are still kept strong by use, and are a racial inheritance in most men.

The Greek philosophers, Thales and Pythagoras, had quite clear conceptions of evolution. About 100 B. C. the Latin philosopher, Lucretius, perceived dimly the same truth, and in recent centuries Swedenborg and Kant almost apprehended the modern evolutionary thought which reached fruition in the mind of Charles Darwin.¹

"The principle of natural selection is intensely Calvinistic; it elects the one and damns the ninety and nine: to him that hath shall be given, and from him that hath not shall be taken away even that which he hath."²

The advent of man probably marks the highest attainment in organic or physical evolution. From this point onward evolution is largely dependent upon the mental, moral, spiritual, ethical qualities in him. His ideals are the governing factors in evolution. Human history shows a constant and, at time, a rapid movement towards better

¹ Joseph LeConte.

² *Through Nature to God*, John Fisk, p. 66.

things, all as the result of man's volition. He changes the appearance, character and habits of both plants and animals to make them more subservient to his needs; and, in the future, will give such attention to the breeding of his own species as to greatly improve the human stock.

"I know of no study which is so utterly saddening as that of the evolution of humanity, as it is set forth in the annals of history. Out of the darkness of prehistoric ages man emerges with the marks of his lowly origin strong upon him. He is a brute, only more intelligent than the other brutes; a blind prey to impulses, which as often as not lead him to destruction; a victim to endless illusions, which make his mental existence a terror and a burden, and fill his physical life with barren toil and battle. He attains a certain degree of physical comfort, and develops a more or less workable theory of life in such favorable situations as the plains of Mesopotamia or of Egypt, and then for thousands and thousands of years struggles with varying fortunes, attended by infinite wickedness, bloodshed and misery, to maintain himself at this point against the greed and ambition of his fellow-men. He makes a point of killing and otherwise persecuting all those who first try to get him to move on; and when he has moved on a step, foolishly confers post-mortem deification on his victims. The best men of the best epochs are simply those who make the fewest blunders, and commit the fewest sins."³

In the conscious evolution of the future it is the moral and spiritual in man that must control. It is a new thing for governments to attempt to justify their actions on moral grounds, but more and more we see the great statesmen of the great nations of the earth trying to prove to the world that they have done and are striving to do the righteous thing. When most men can be induced to order their lives according to these principles of right and wrong, it will make life easier and happier for everyone,

³ *Science and Christian Tradition*, Huxley, p. 256.

and the necessity for fighting and bloodshed will disappear.

It is one of the laws of God that nothing worth while can be obtained without work, which means a conflict with Nature in some of her forms: if a man would be wise, he must study and think; if he would be good, he must maintain an eternal conflict with the animal that is in him; if he would be rich, he must either revert to the predatory habits of his simian ancestors, or exercise his intelligence and his physical powers to the utmost; some rich men have done both. Men are eternally trying to obtain wisdom or piety or riches without paying the price, but God never gives anything away. Man must pay. Religions and philosophies innumerable have been invented which were and are guaranteed to lift the soul, in a moment, from the selfish, sensual, material abyss into which it has sunk or from which it has never risen, and insure it a place in a heaven of animal enjoyment. These religionists and philosophers forget that the devil can only be cast out by fasting and prayer; that the animal in man must be *overcome*, and that righteousness on earth must precede a joyful heaven.

"The intelligence which has converted the brother of the wolf into the faithful guardian of the flock ought to be able to do something towards curbing the instincts of savagery in civilized man." ⁴

Evolution demands and presupposes theism. The existence of evil or sin simply evidences that evolution has not yet reached perfection. Evil is the natural characteristic of the beast, and in the last analysis is selfishness. It was not evil in the lower stages of evolutionary development.

Man's material body was a necessity for the development of the soul and apparently it was created for no other purpose. It is the temple of God; the abiding place of the Holy Spirit, and should be maintained in spotless

⁴ *Evolution and Ethics*, Huxley, p. 85.

purity. Sins of the body inevitably leave their mark upon the soul. "A man's character impresses itself upon his face, his form and his clothing," and beauty in the soul is sure to be reflected upon the face.

There would be no sense in the bounty of Nature if there were no mankind to use it. What use would there be for abundant harvests and all the woods of the forests, the iron and coal and oil, the stones and soils, and the powers of steam and electricity, if man had not appeared upon the earth to use them? All these things were intended for the development of his body, that it might become a suitable tenement for his soul. Toward this end Nature, which is God, has been working through all the ages.

While it may be physically right to perform any act that will promote physical happiness or comfort, and while it may be mentally right to promote and develop learning and intelligence and all that tends to increase mental strength, it should never be forgotten that moral right pertains to the soul, which is the highest development of evolution, and that no physical or mental activities must ever be allowed to mar its beauty. The conscious soul is the greatest reality that we know of by personal experience, and may well be called a child of God.

"What a piece of work is a man, how noble in reason, how infinite in faculty, in form and moving how express and admirable, in action how like an angel, in apprehension how like a God, the beauty of the world, the paragon of animals!"

In the conflicts of material nature selfishness was the greatest virtue, as it was necessary to enable the strongest, wisest and shrewdest to survive, but on the moral plane, after the soul and spirit were born, a new law of evolution became operative, and selfishness became the one and almost the only sin. The moral man, while he provides for and protects himself, will not harm his neighbors.

During the savage stage of evolution and before, while man was slowly climbing from the beast, the qualities

most desirable, even absolutely essential for his existence, were strength, cunning, a determination to slay his competitor for no other reason than that he was a competitor, and a determination to seize and hold everything that pleased him, regardless of the feelings or rights of others. When he had demonstrated that he could successfully carry out these determinations, by means of his strength and cunning, he had demonstrated that he was the fittest to survive and propagate his species; for Nature, at this stage had no use for conscience, and no conscience had yet developed.

It is a law of Nature (which means God), that evolution never develops backward; when a stage of progress has been passed through, it is never repeated. When man entered the stage of civilization the moral qualities were developed as a sequence to the intellectual, and that which was right for the beast, and allowable in the growing intelligence of the savage, became a sin to the civilized man. The persistence of these beastly qualities in a civilization which is very far advanced is the "original sin" of which we have heard so much, and is a constant reminder of man's anthropoid ancestry. All criminals are savages.

God's universe is one, and everything in it works with everything to promote the day of the Lord, when righteousness shall fill the whole earth.

"That little fire which glows, star-like, across the dark-growing moor, where the sooty smith bends over his anvil and thou hopest to replace thy lost horseshoe—is it a detached, separated speck, cut off from the whole universe, or indissolubly joined to the whole? Thou fool! that smithy's fire was primarily kindled at the Sun, is fed by air that circulates from before Noah's deluge, from beyond the dogstar; therein with iron force and coal force and the far stronger force of man, are cunning affinities and battles and victories of force brought about; it is a little ganglion or nerve centre in the

great vital system of immensity. * * * Detached! Separated! I say there is no such separation; nothing hitherto was ever stranded, cast aside, but all, were it only a withered leaf, works together with all; is borne forward on the bottomless, shoreless flood of action, and lives through perpetual metamorphoses." ⁵

The world is filled with wicked, weak and ignorant people, whom Carlyle called fools. So long as this condition exists, all sorts of foolish, and debasing and harmful beliefs will infest the earth, and the exponents of these absurd beliefs will never fail to assure you that their inspiration is directly from God.

Long before the Hebrews settled in Goshen, the Egyptian "Book of the Dead," or the "Book of Redemption," contained the moral code of the Egyptians, after which were copied the Ten Commandments, and out of which Moses formulated the moral code of Israel. The right and wrong, or good and evil which these moral codes defined were simply higher or lower ideals or conceptions of moral values.

The moral law grew because the work of the world could not be carried on without it. It is the growth of ages, founded on human experience. The individual has inherited an ancestral experience which is the accumulation of hundreds of generations, to which is added the teachings of his immediate ancestors, and the teachings of the community in which he is reared. This individual finds that his own safety and prosperity depend on the safety and prosperity of his country and his neighbors, and thus are developed patriotism and loyalty to friends and neighbors: he finds that he must do unto others as he would have others do unto him; in other words, that he must not be selfish, but must see that each individual about him receives his just due, and that he renders to his community and his country all that they

⁵ Carlyle.

require of him. This is unselfishness, which is all of morality.

Morality is often buttressed by religion, which consists of service and love to man and veneration and love for God. It adds to the fear and respect in which these laws or rules of morality were held to attribute them to the direct command of God, or of some of the gods of paganism.

"It is only after long ages of social discipline, fraught with cruel afflictions and grinding misery, that the moral law becomes dominant and religious aspiration intense and abiding in the soul. When such a stage is reached, we have at last in man a creature different in kind from his predecessors, and fit for an everlasting life of progress, for a closer and closer communion with God in beatitude that shall endure." ⁶

"Two things fill my mind with ever-renewed wonder and awe, the more often and deeper I dwell on them—the starry vault above me and the moral law within me." ⁷

"I assert as a biological fact that the moral law is as real and as external to man as the starry vault. It has no secure seat in any single man, or in any single nation. It is the work of the blood and tears of long generations of men. It is not in man inborn or innate, but is enshrined in his traditions, in his customs, in his literature and his religion. Its creation and sustenance are the crowning glory of man, and his consciousness of it puts him in a high place above the animal world." ⁸

"Not from a vain or shallow thought
His awful Jove young Phidias brought,
Out from the heart of nature rolled
The burdens of the Bible old,
The litanies of nations came
Like the volcano's tongue of flame,
Up from the burning core below

⁶ *Through Nature to God*, John Fisk, p. 53.

⁷ Kaut.

⁸ Chalmers Mitchell.

The canticles of love and woe,
The word by seers or sibyls told
In groves of oak or fanes of gold
Still floats upon the morning wind,
Still whispers to the willing mind,
One accent of the Holy Ghost
The heedless world has never lost." ⁹

The moral law grows, not only in the community and the race, but in the individual. That which we term innocence in the child develops into virtue in the strong man who is not only passively good but is willing to fight that which is evil, even to the death. So, too, vice and evil may be cultivated till they become a source of pleasure, and until the soul is dead in trespasses and sins. Even to think, with pleasure, of a bad action is wrong, and this continued thinking will make its eventual performance easy.

"Vice is a monster of such frightful mien,
That to be dreaded needs but to be seen,
But seen too oft, familiar with her face,
We first endure, then pity, then embrace."

That old pagan, Socrates, had a wonderful vision of the beauty of virtue, and of its beautifying effect upon the soul, and of the highest truths of modern evolution, when he was able to understand that virtue and wisdom and wealth were one. His prayer, which may be found at the close of *Phædrus*, is perhaps the most beautiful and sublime aspiration which paganism has produced:

"Beloved Pan, and all ye other gods who haunt this place, give me beauty in the inward soul, and may the outward and inward man be at one. May I reckon the wise to be the wealthy, and may I have such a quantity of gold as none but the temperate can carry."

The King James version of the Bible has had most to do with developing and promoting moral growth among English-speaking peoples. The following opinions of

⁹ Emerson.

Professor Huxley are of interest: "Consider the great historical fact that for three centuries the Bible has been woven into the life of all that is best and noblest in English history; that it has become the national epic of Britain, and is as familiar to gentle and simple people as Dante and Tasso once were to the Italian; that it is written in the noblest and purest English, and abounds in exquisite beauties of mere literary form; and, finally, that it forbids the veriest hind, who never left his village, to be ignorant of the existence of other countries and other civilizations, and of a great past stretching back to the furthest limits of the oldest nations in the world. By the study of what other book could children be so much humanized, and made to feel that each figure in that vast historical procession fills, like themselves, but a momentary space in the interval between the eternities; and earns the blessings or the curses of all time, according to its efforts to do good, and hate evil, even as they also are earning their payment for their work." ¹⁰

Our bodies were made to be the temple of the soul or spirit, which should be holy, and we can conceive of no other purpose for their existence. Moral and spiritual perfection are the ultimate ends for which all the cosmic processes have been working, and an "historical survey of the genesis of humanity seems to show very forcibly that a society of human souls living in conformity to a perfect moral law is the end towards which, ever since the time when our solar system was a patch of nebulous vapor, the cosmic process has been aiming."

The spirit, incubated in the matrix of Nature for millions of years, finally came to birth in man. Some men develop that spirit and become worthy of immortality; what shall we say of others who, so far as we can perceive, remain animals all their lives, whose microscopic spirits never grow? Are they eventually scrapped, as unfit for development, or will they be given a further chance

¹⁰ *Science and Christian Tradition*, Huxley, p. 56.

in a future state? God is no economist and often throws away that which He has taken millions of years to make.

“What place have they in the great scheme of things,
To whom both place and time have been denied
In which to win their victory, though they tried?
Though in this world defeated and perplexed
Will pitying God not heed them in the next?” ¹¹

“Nature, through the whole geological history of the earth, was gestative mother of spirit, which, after its long embryonic development came to birth and independent life and immortality in man. Is there any conceivable meaning in Nature without this consummation? The whole evolution of the cosmos through infinite time is a gestative process for the birth of spirit, a Divine method of the creation of spirits.” ¹²

Properties or qualities are born or developed. Two elements, which in no way resemble each other, may unite to form a substance which does not resemble either of them. Hydrogen and oxygen unite to form water, like neither of them. Man is developed from a germ cell or a spermatozoa, a great tree from an insignificant seed, and immortality is developed in man when its beginnings, which are planted in him, have had time to germinate and grow. God is a Spirit, and that part of man which is immortal is a spirit. “Man is a child of God, capable of separate life; separate, but not independent of Nature: Nature is not for him any longer the gestative mother, but still the nursing mother of spirit. We are weaned by death.

“Self-consciousness, especially, seems to me the simplest sign of separate entity or spirit individuality, and its appearance among psychical phenomena the very act of spirit birth. We may imagine man to have emerged ever so gradually from animals: in this gradual development

¹¹ Bertha Waldo Van Blarcom.

¹² *Evolution and Religious Thought*, Joseph LeConte.

the moment he became conscious of self, the moment he turned his thoughts inward in wonder upon himself and on the mystery of his existence as separate from Nature, that moment marks the birth of humanity out of animality. All else characteristic of man followed as a necessary consequence. I am quite sure that if any animal, say a dog or a monkey, could be educated up to the point of self-consciousness (which, however, I am sure is impossible) that moment *he* (no longer *it*) would become a moral responsible being, and all else characteristic of moral beings would follow. At that moment would come personality, immortality, capacity of voluntary progress, and science, philosophy, religion would quickly follow.”¹³

The spirit which has been born in man is not material. Spiritual things must be spiritually discerned and are not *necessarily* governed by material laws, but by the laws of spirit. “Blessed are the pure in heart, for they shall see God,” not in a future state only, but in nature all about them. The ideal man, the perfect man, the divine man, will be developed as the perfection or result of spiritual evolution. He need not necessarily be all-wise or physically perfect, but his spiritual nature will be perfect. Will this man ever be seen on this earth? He will. This perfect man is not God.

God is invisible to the material eye, as man is invisible. We see the works of God and the manifestations of His wisdom and power, but these eyes can never see Him. We never see our friends; they are hidden in the bodies which envelop them; they look out through their eyes and speak to us with their tongues; if the eye is destroyed, they cannot look out, if the tongue is paralyzed, they cannot speak, but our friends are there just the same. “The problem of the connection of body and soul is as insoluble in its modern form as it was in the pre-scientific ages.”¹⁴

The time may come when the human mind will appre-

¹³ *Evolution and Religious Thought*, Joseph LeConte, p. 323.

¹⁴ *Fragments of Science*, Professor Tyndall, p. 88.

hend the rays of knowledge which are now outside its intellectual spectrum, and, by methods which at present we know not of, be able to analyze as clearly and use these extra—at present—knowable facts as it is now able to appreciate and often use the invisible rays of the solar spectrum. More than half the rays emanating from the sun are not visible to the eye, and, until recent centuries, their existence, separate from the light rays, was not understood. Why may not rays of knowledge about the soul be darting all about us, which we have, as yet, no mental or spiritual apparatus to detect?

Why may there not be horses of fire and chariots of fire, fighting the battles for righteousness as real as the bleeding armies which we see? A spiritual science may be developed which will be as real as the physical science of our century. That animal which has developed or evolved from the chattering anthropoid of the forests up to a Newton or a Galileo or a Shakespeare will not cease to develop and find out by searching many more of the ways of God.

The existence of the ether of space is probably as indubitably proved as any scientific fact, but it has never been seen and no chemist has analyzed it. Its wonderful elasticity and its extreme tenuity are perhaps its only properties that science has thus far been able to apprehend. It is supposed that light travels 196,000 miles per second by means of light waves propagated through this ether of the interstellar spaces, and radiant heat travels by the same method. Numerous electric and magnetic phenomena are also best explained by the theory of the presence of this ether which has so far eluded the search of scientists as to be still classed as imponderable.

If, in the physical world, there are phenomena which prove to the thoughtful mind the presence of an imponderable substance, why should we doubt the presence, in the mental and spiritual world, of the soul of man,

though no mortal has ever seen it, or felt or weighed it, and though it is known only by its manifestations?

If we had no eyes, probably we should never know of the existence of light, or of any of the laws governing its transmission. For thousands of millenniums the sun and moon and stars were not to be seen from this planet, because of the blanket of watery vapor and carbonic acid gas which completely enveloped it; and, had there been a man upon the earth, he would never have suspected their existence. There are, indeed, more things in heaven and earth that are not dreamed of in our philosophies.

At the present time a slight increase of moisture in our atmosphere would render the sun and moon and stars invisible, and, as these bodies would then be outside the field of our experience, it would be natural for cautious people to deny their existence.

Love is the finest product of evolution that we are able to apprehend. If there be anything finer or better, it has not yet been revealed to men, and we have no organs or senses which can apprehend or understand it. Love is the greatest thing in the world: it worketh no ill, and is the fulfilling of the law. "Though I speak with the tongues of men and of angels, and have not love, I am become as sounding brass or a tinkling cymbal, and though I understand all mysteries and have all knowledge and all faith, if I have not love I am nothing; and though I give all my goods to feed the poor and my body to be burned, if I have not love, I am nothing. Love suffereth long, is not boastful, is not conceited; seeketh not her own pleasures; thinketh no evil; beareth all things; hopeth all things; endureth all things." Love is the one thing that shall abide when everything else that we know of shall pass away. God is love, and those spirits who have attained unto that perfection which is described above are surely near to God, and may stand among the seraphs around about His throne.

These spirits of our fellow-mortals are contained in

earthen vessels, and sometimes it is only these vessels that we love. Perhaps the visible body is the perfection of beauty in form and motion and color, and the brain which dominates it is capable of evolving the most beautiful and majestic thoughts, but if the soul within it is mean and low and selfish, it is unworthy of the undying affection of a soul which has evolved beyond the purely animal stage of its development. The love of the mother for her children is the most perfect example we have on earth of this Divine quality, because in it there is nothing selfish; the mother expects and receives nothing but affection in return for her love, and therein it is perfect. This conception of love as the greatest thing in the world, and as a reflection or prophetic type of what is to be experienced in the next stages of our existence, compels us to ignore or reject a major portion of the theology which has been taught us from our youth, as we are able to perceive that most of it is the invention of men, and entirely contrary to what God has written in this Book of His. "By faith we disbelieved and denied. By faith we said of that stuffed scarecrow of divinity, that incoherent accumulation of antique theological notions, the Nicene deity: 'This is certainly not God', and by faith we have found God." ¹⁵

As in the physical and intellectual world man has learned to live in communities and states and co-operate with his fellows for the general good, so in the higher development, where love is the chief attainment, man is learning to love his fellowman. "If a man love not his brother, whom he hath seen, how can he love God whom he hath not seen?" The name of him who loves his fellowmen the most may head the list of those who love the Lord. This love for fellow-mortals should not be limited to a mental state, but should show itself in deeds of self-sacrifice, and devotion to the helpless, the needy, the ignorant and the vicious. God is an inhabitant of these human temples, and we are given the inestimable privilege

¹⁵ *God, the Invisible King*, H. G. Wells, p. 13.

of ministering to Him, of feeding Him, clothing Him, visiting Him in sickness and in health, and of sympathizing with Him in a world of troubles. "Inasmuch as ye did it unto one of the least of these, my brethren, *ye did it unto Me.*"

The future should hold no terrors for him who has done the best he could; angels could do no more. And though his achievement may seem small, we must remember that with God there is nothing great or small; and that the widow who cast her mite into the treasury did more than all the rest, for she gave all that she had.

"So live, that when thy summons comes
 * * * * * Thou go not
 Like a quarry slave scourged to his dungeon;
 But sustained and soothed by an unfaltering trust,
 Approach thy grave like one who wraps the drapery
 Of his couch about him, and lies down to pleasant dreams." ¹⁶

God, who through countless millenniums was preparing this earth for the residence of man while he was undergoing his preliminary training, or his kindergarten course, and who spent millions of years in building up the spiritual nature of man, will not forsake His child when he is promoted to a higher class, and, as a result, is separated from all the individuals and associations and experiences which he knows. Bryant, in the *Water Fowl*, beautifully expresses this idea of the leadership or guidance of God:

"He who from zone to zone
 Guides through the boundless sky thy certain flight,
 In the long way that I must go alone
 Will lead my steps aright."

When the soul has "shuffled off this mortal coil," will the same laws of evolution, selection of kindred spirits by each other, and the survival of the fittest still prevail? It seems as though they might, though that is a question

¹⁶ William Cullen Bryant.

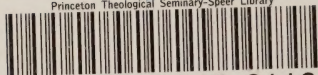
we cannot answer now. From that realm we are not yet prepared to admit that a traveler has returned, and the laws of spirit are yet to be found out. The science of spirit life is being carefully investigated by competent, earnest, pious men and women, and may we not hope that, as in other departments of science, they may find out, by searching, some of the laws of God which are operative in this spirit world? It is a scientific field which most of us are not competent to enter, and about the laws of which most of us are not fitted to express an opinion. It has been a belief in all civilizations, which is reflected in all the literature of the world, that certain people at certain times have been in direct communication with those who have passed beyond. Are we justified in calling it *all* superstition or imposture?

Saul consulted the witch of Endor, and thought he received a message from Samuel, the departed seer: the chosen disciples, on the Mount of Transfiguration, witnessed and listened to a conversation between their Master and Moses and Elias: Paul was caught up to the seventh Heaven, and saw and heard things unspeakable: Joan of Arc listened to the voices: and more modern men, of whom Sir Oliver Lodge may be taken as the type, have assured us that repeatedly they have received messages from the dead.

We need not necessarily be unbelievers because we are not able to believe. We must wait with an open mind. Most of us would better leave the investigation of this subject to others. "I recommend people in general to learn and realize that their loved ones are still active and useful and interested and happy; more alive than ever in one sense, and to make up their minds to live a useful life till they rejoin them."¹⁷

¹⁷ Raymond, Sir Oliver Lodge, p. 342.

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